An Air Age Publication

MODEL AIRPLANE NEWS

48120 May 1988 $2.95

TH ODELING MAGAZINE Canada $3.75

CONSTRUCTION: BABY BIPE - .15-size Aerobat

4 KIT REVIEWS!

How to simulate glazing with films.

"HOLLYWOOD PILOT" ...The PAUL MANTZ Story

NUREMBERG SHOW

CONTINENTAL HAPPENINGS

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MODEL AIRPLANE NEWS

ON THE COVER: As a flight of T-6s makes smoke trails across a vivid Oshkosh sky, Art Director Alan Palermo spotlights some of this issue's features. From top to bottom: Royal's PDQ Cherokee 25 on a low pass; James Cagney discussing a film scene with Paul Mantz; designer Harry Stewart displaying his Baby Bipe, which is featured in our construction article for this month.
ABOVE: Royal's Cherokee 25 wets its feet in a left-over puddle just prior to launching on another fun-filled sortie. Photo by Rich Uravitch.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 251 Danbury Rd., Wilton, CT 06897. Second class postage paid at Wilton, Connecticut, and at additional mailing offices. Subscription rates are $25 for 1 year (foreign $33), $47 for 2 years (foreign $63), $65 for three years (foreign $89). **Postmaster:** Send Form 3579 to **Model Airplane News**, P.O. Box 428, Mount Morris, IL 61054.

Editorial

by RICH URAVITCH

ATTENDANCE AT TRADE SHOWS like WRAMS, IMS, Toledo, RCHTA and others, provides the industry with a clear signal that a lot of people are getting involved with R/C activities. Each year, the previous year's attendance figures are usually exceeded. A lot of the new input comes from the tremendous growth of the R/C car hobby. Figures I've seen indicate that cars account for 60 percent or more of the total R/C market. Our sister publication, *R/C Car Action*, is experiencing unprecedented growth for a specialty magazine. Since all the car guys are already involved in R/C, why not invite some of them to your field to perhaps give flying a try? It would give you a perfect opportunity to explain the necessity for careful observance of our frequency differences and perhaps prevent the very costly "shoot downs," which we're starting to hear about with alarming regularity. A side advantage, especially among the younger car operators, is that it will expose them to the three-dimensional world of flying from which

we derive so much pleasure. I'm sure there's some Tournament-of-Champions or Scale-Masters potential out there driving off-road buggies! Think about it.

We're working on a trainer issue which we hope will provide some solid, timely recommendations and guidance for the same newcomer I've just talked about. We'll have our usual "Field & Bench" product reviews (trainers only), and we'll try to present information that will allow the beginner to sidestep some of the problems that many of us experienced early in our R/C "careers." How about sharing your experiences with us? We've all discovered, many times in retrospect, things that would have made learning to fly much easier. Share it with a new guy! Remember how helpful someone with the experience you now have could have been to you when *you* started in R/C? Let's hear from you.

• Your response to the "Reader Reports" in mini "Field & Bench" has been great. The rules are simple: Send us two or three paragraphs plus a couple of pictures of a kit you've built, and tell us what you liked and what you didn't. If we run it concurrently with the standard "Field & Bench" we normally use, we'll award you a complimentary subscription. Check out the Great Planes ElectriCUB in the last issue to get the idea. Reviews currently underway are:

Byron Originals BD-5J
Bob Parkinson Regal Eagle
GM Plastic Corsair
Hobby Shack Loadstar
Great Planes Super Sportster 120
Dynaflite Fun-Scale Mustang .60
Aristo-Craft J-3 Cub
Duracraft Duraplane
Sig Citabria
Goldberg Super Chipmunk
Byron Originals Bullet
Ace 120-4 Bipe
Sig Spacewalker
Yellow Aircraft A-4 Skyhawk
Ace Seamaster 40

Don't miss our next issue; it will feature aerobatics!

MODEL AIRPLANE NEWS

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U.S. & Possessions (including APO & FPO): 1 year $25.00; 2 years $47.00; 3 years $65.00. Outside U.S.: 1 year $33.00; 2 years $63.00; 3 years $89.00. Payment must be in U.S. funds.

MODEL AIRPLANE NEWS is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897, phone 203-834-2900. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Y.M. Micik, Treasurer. Second Class Postage paid at Wilton, Connecticut, and additional Mailing Office. ISSN No. 0026-7295.

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Airwaves

ANTI-ANTI ARF GUN or: I somehow knew this would happen!

My letter is in response to Mr. Waterman's letter in the April issue entitled "Anti-ARF Gun." Mr. Waterman, while you're being sick, I think I'm going to laugh myself to death. I read your letter over several times, making sure that you did, in fact, show such narrow-mindedness and such an opinionated nature and wrote for the whole world to see forever. GOOD JOB!

This past summer, with the help of two good instructors, I became a successful R/C pilot with one of those "no-good" ARFs; a Royal Cessna with an O.S. .40. You say, "the fact remains that a favorable wing-loading is more valuable than saved time." That's true; the trouble is, you don't have all the facts. In actuality, many of the better ARF trainers are no heavier than a well-built balsa plane. My Cessna weighs just 5½ pounds and has 615 square inches of area. Put that in your wing-loading pipe and smoke it! I spent every weekend I could in the spring of '87 at the field, watching models fly and chatting with experienced R/C pilots. They told me about the Royal Cessna I now have and the RPM Cessna, which has about 610 square inches of area, and how they'd had good luck instructing new pilots with both of these kits.

Subsequent visits to the field bore this out. These two Cessnas did, in fact, land just as slowly and predictably as their balsa counterparts. And no, these balsa models weren't overweight examples built by fools; they were two well-built P.T. 40s and one Midwest Aerostar 40. It's true, ARFs are much more expensive, but time is money, and these kits save a lot of time. Some people have very demanding work and cannot go for the all-time model-building record as you have. I fall into this category and thank *Model Airplane News* for the great ARF issue. How presumptuous of you to speak for all of us when you say "*MAN* did aeromodeling a disservice glorifying ARFs." Shocking as this may be to you, your opinion surely doesn't reflect the entire modeling world! Some newcomer, who doesn't have your free time, may take you seriously and stay away from ARFs, never to experience the joy of building and flying R/C planes. Please, Mr. Waterman, for our sake and your own, get the facts before you commit yourself in writing.

JOE BENIDETTO
Seattle, WA

Dueling Band Woes

A buddy of mine and I have been flying together for the past year. We normally stand about 30 yards apart, and have never had any problems. The last couple of times, while bringing my plane in for a landing, the throttle would either fluctuate or go to wide open. This would only happen as the plane was passing in front of my friend, about 15 yards from him. When I landed it, we checked it out. We found that my friend's radio was taking control of my throttle—and *only* the throttle—nothing else. What goes? It seems odd that it would only affect one channel. Usually, radio interference from someone else's radio will send *all* the controls nuts.

I know this from experience, as about two months ago I was shot out of the air from about 300 feet altitude. The plane went in nose-first at full throttle, so you can imagine the outcome. What caused this crash is what frustrates me. A stranger came to our field, and instead of checking to see what channel we were using, he only checked to see if anyone had an FM radio. He thought he would be safe if no one else had FM. Well, guess who had the same channel, but with an *AM* radio!? You got it!

Since then, I've found other people with the same belief. Would you please explain to them that if they're using the same channel, regardless of whether it's on an AM or FM radio, interference will occur. I hope this will save someone else from watching helplessly as their new

(Continued on page 10)

Airwaves

(Continued from page 8)

plane hit the ground like mine did! Thanks.

JACK M. SHOEMAKER
McBride, MI

Jack, where I come from, that "stranger" owes you a new airplane. Since you didn't identify the channels on which you and your friend experienced interference or possible "cross-talk", we can't help much with your first question, but FM (frequency modulation) and AM (amplitude modulation) on the same channel (frequency) can definitely interfere with each other. We'll let your informative letter serve as an advisory to other modelers. RAU

Coming Soon

I have a question. Have you ever had an F&B Review on the Byron Originals' BD-5J and the F-16 Fighting Falcon? Keep up the good work and thanks!

DAVID SHY
Anaheim, CA

The Byron F-16 F&B Review, by Art Shroeder, appeared in the September 1981 issue of Model Airplane News. *Art has just completed a review on the BD-5J, which will be presented in the June of* MAN.
RAU

OOOOPPPSS!!

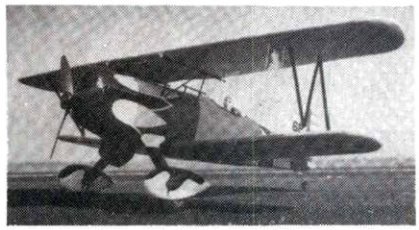
Last month's Scale Masters coverage included a shot of a razorback P-47 Thunderbolt on final, which I erroneously credited to the building skills of Bob Olson. Bob's Thunderbolt was equally pretty; I just didn't get a good picture of it! The Jug in the photo was built and flown by Jeff Micko of Minnesota. It weighs 21 pounds, is ST 3000-powered and was built from the Mike Beaulieu plans. The *other* faux pas: ... the builder of the red "Yippee" P-38 is a living, breathing modeler; Diego Lopez by name, *not* the island outpost, Diego Garcia!! Sorry, guys.
RAU

In Search of Cleveland?

I really enjoy your mag; I used to read it a lot when I was a kid. Do you have any information on the Cleveland Model Airplane Company? I used to build their kits in the 1940s and heard that they were still around, but that they don't have the old kits anymore. Do they still have the plans?

GEORGE SNELL
Santee, CA

George, as far as I know, your info is correct. Cleveland Model and Supply Co. no longer sells kits, but does have an extensive line of their plans available. These were considered "de rigueur" by scale enthusiasts the world over. They are presently available in various sizes—some even in ¼ scale. Contact aviation's best friend, Edward T. Packard, at Cleveland Model and Supply Co., 103075 Detroit Ave., Cleveland, OH 44102. Phone: (216) 961-3600. RAU



Old-Time Desire

As a long-time subscriber to your excellent magazine, I was very interested to see in the "Editorial" and "Airwaves" departments mention of desires by old-time modelers for information on old equipment that is no longer available. I'm an old-timer who is very interested in obtaining plans for a Curtis Wright P-6E, which was kitted and marketed by Carl Goldberg a few years back. This plane, as kitted, was for a .25 engine. It was a beautiful scale that I saw at an auction in Virginia a year ago. I'm referring to the February *MAN* issue.

If you, or any of your readers, could help me obtain a copy of the Goldberg P-6E plans, I'd be grateful. Your cooperation is most appreciated. Thank you.

WILLIAM A. RITCHIE
Temple Hills, MD

Bill, I remember the design, even built one myself. As I recall, it was designed by Bob Rich, it featured a pair of foam wings and could be flown 3-channel. I didn't save my plans, but maybe one of our readers can help. How about it folks? Mr. Ritchie's address is 6413 Roberts Dr., Temple Hills, MD 20748. RAU

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

FLIGHT BOX KIT

ROYAL

by RICH URAVITCH

Opposite side of the box is perfect for "billboarding" with club stickers and decals.

Flight box provides more-than-adequate room for all the required equipment. Plane cradles not yet attached.

WHEN YOU'VE BEEN in this hobby for a while, trips to the flying field are generally done by rote. Everything you need to support the flying machine you spend all that time with is exactly where you placed it the last time you returned from the field ...or *is* it? I've spent a few years in the hobby and, up until very recently, I've transported most of my support equipment in containers ranging from milk cartons to gallon cans, but I've mostly used cardboard boxes for the extensive array of tools, props, spare parts, adhesives and similar equipment that we simply can't afford to go flying without.

Like most modelers, when I first recognized the need for a means to house and transport this equipment, I made a list of everything I "needed," and all the features I'd like, and I then set out to design the ultimate box. I worked feverishly on the project, convinced that I hadn't overlooked a thing. Sure, the feature list had grown some; the ice chest was essential for those hot summer flying days, and the running water sure made clean-up lots easier. I did have an extra car battery which had ten times as much amperage available as my motorcycle battery—perfect for those cold-weather starts!

Finally, my preliminary sketches were complete. When the final result looked very much like something that was brown and had "UPS" painted on its side, I scrapped the drawings and started thinking a bit more practically. The solution was handily found in the new Royal* Escort field-box kit. It has sufficient space to carry the practical things that you really *do need*, like fuel, battery, starter, power panel and fuel pump. It also has storage space up top for things like your transmitter, ignition battery, tachometer, plugs, props and Zap. Two Velcro-fastened, 22x6½-inch drawers keep the spare hardware and other essentials in order.

This is a kit that isn't unlike some of the more contemporary airplane kits. All the parts are pre-cut from what appears to be a Luan-type ply,

(Continued on page 14)

Assembly is made simple by accurately-cut ply parts and Zap. Use a triangle to ensure square joints. Masking tapes used to temporarily identify parts.

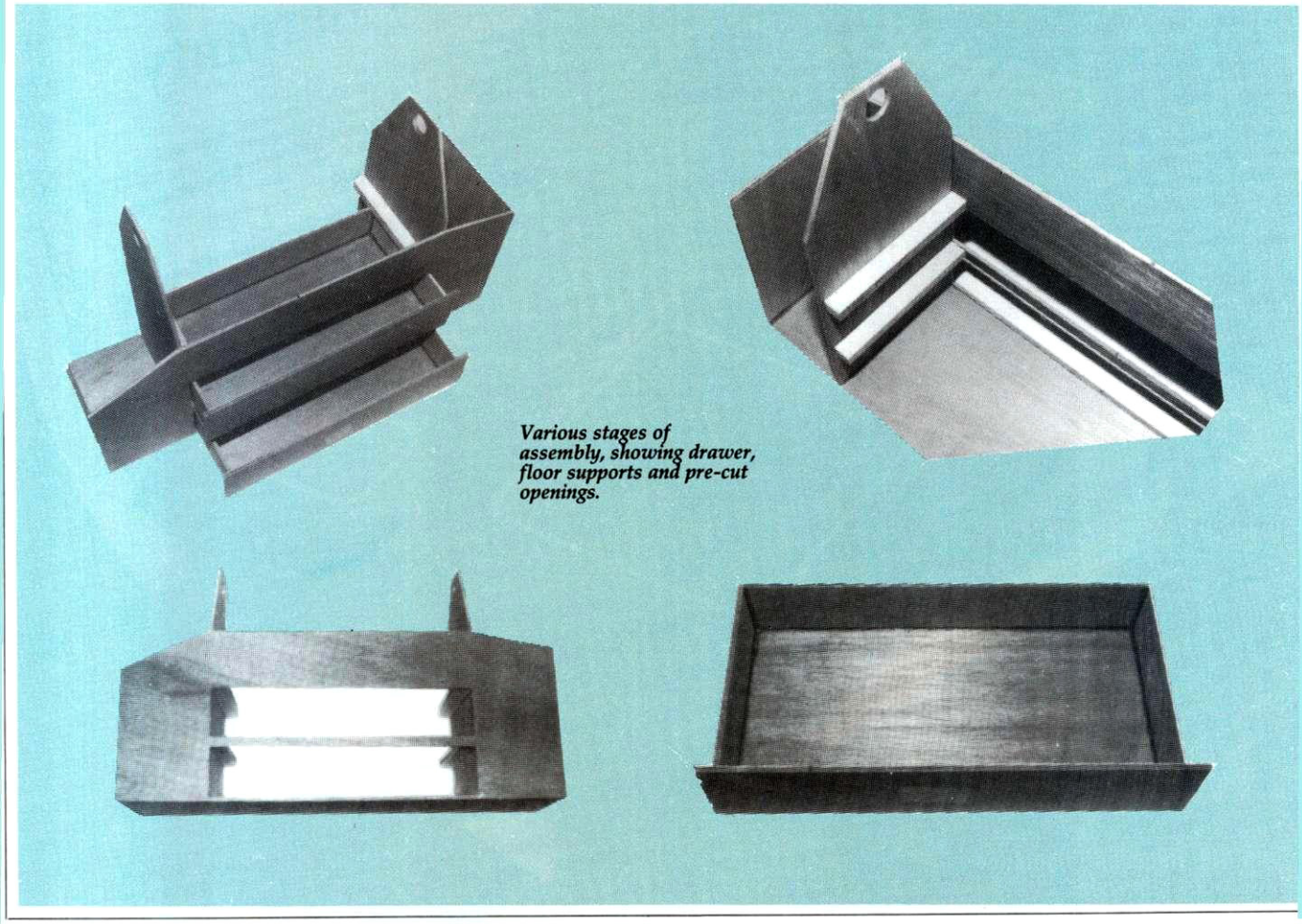
and they're all square cut, something which I don't find particularly easy to accomplish on my own.

Assembly is easy, and owing to the type of wood used, lends itself extremely well to the use of Zap CA for build-up. I used the thicker variety of Zap to glue the pieces together, followed by an insurance fillet. The box went together without problems, as the fit of the parts was great. I *did* cut some battery vent-slots in one end to allow air to flow freely through that end of the box, but that's the only thing I changed. Total *building* time was about two hours.

Finishing, however, was a rather different story. We've all seen "veteran" field boxes whose surfaces held more fuel and oil than the airplane ever did. I was determined that mine would remain pristine and professional-looking for many years. In order to achieve this, I concluded that it would have to be finished in much the same way as we finish our airplanes and, since I didn't think I could hack it with MonoKote, I opted for paint. Store-bought Red Devil-brand polyurethane was chosen: clear for sealer and top-gloss coats and red for the color. I brushed on a total of six coats, sanding lightly between the second, fourth, and final coats. Applying coats one and two was like painting a sponge, as it *all* soaked in quickly. Two coats of red were applied, followed by personal markings and stickers, and over these went two additional coats of clear. The finish now looks really great, and I'm certain that it will hold up well. It was a fun project; one which produced something both functional and necessary. The Royal Escort box really *does* carry all the essentials, I can hand-carry it, and I didn't have to paint it brown!

**Here is the address of the company featured in this article:*

Royal Products Corp., 790 West Tennessee Ave., Denver, CO 80223. ■



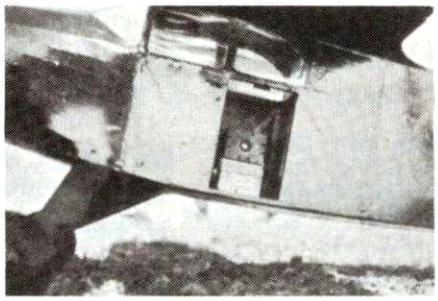
Various stages of assembly, showing drawer, floor supports and pre-cut openings.

Fifty Years Ago...

by RICK NACCA

FIFTY YEARS AGO this month, *Model Airplane News* predicted that aeronautical engineers would turn their thoughts back to wood construction. Wooden airplanes of the day used then-modern glues that eliminated the need for using nails in joints—a technique that promised to render the aircraft's surface "as smooth as that on an automobile." Used with heat-resistant Bakelite thermoplastic molding, wood became such a durable construction medium that it would even resist the flame of a blowtorch! Many of these 1938 state-of-the-art wooden planes were nearing completion, and the use of metal was to remain, for just a few years, largely unexploited due primarily to high cost and limited availability.

A pioneering effort in model aerial photography.



During a left-hand sweeping bank, the Univex Model "A" camera could capture a bird's-eye view.

A "how-to" article offered plans for building a gas-powered camera model for aerial photography. The camera was mounted in the fuselage of the plane, and pictures were taken through an opening in the *side*, rather than in the bottom. Using a standard Univex Model "A" camera, the model was touted as "the first gas model to obtain worthwhile aerial photos."

The Curtiss XP-37: the boldest aircraft of the day.

The same issue featured the Curtiss XP-37 on its cover. The "modern" high-speed fighter sold for a whopping $40,800. That's less than the price of a current-day ejection seat!

Also in May of that year, *Model Airplane News* teamed with Metro-Goldwyn-Mayer and sponsored an essay contest in which contestants could compete for a coast-to-coast airplane trip to Hollywood and back! The essay question: "What do you think of the airplane as a means of national defense?" The contest was open to "all air-minded Americans." As an added prize, the writer of the winning essay would be presented with an exact replica of the aviator suit worn by Clark Gable in the movie *Test Pilot*. And Clark Gable would personally present the suit to the winner!

Well, the move toward wooden planes nose-dived, you might say, right after World War II, as surplus metal, immigrant metal workers and machinists all arrived at American aircraft production lines. Today, metal has all but replaced wood, though wood is still used for many contemporary home-built aircraft. The stealth aircraft of today's Air Force have increased a bit in price over the pre-war Curtiss XP-37, and reconnaissance aerial photography has evolved to include such technology as Low-Light TV (LLTV), Target Identification Set Electro-Optical (TISEO), and Forward-Looking Infrared (FLIR). We can now watch a battle of red and black ants on an old tree stump!

Next month: a nostalgic trip to the stratosphere.

Wooden planes were viewed as the wave of the future, because they were relatively cheap to build. This Cessna Airmaster was a breakthrough—its cantilevered wing required no struts.

Basics of Radio Control

by RANDY RANDOLPH

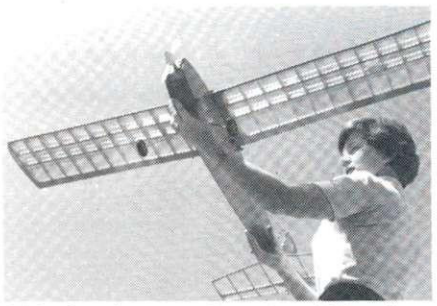
Sport airplanes come in all shapes and sizes. This one uses a .40 4-cycle and has a high power-to-weight ratio, as well as a low wing loading; all ingredients for good flight performance.

A LOT HAS BEEN written in these pages about kits, radios, trainers, instructors, techniques, etc., but little has been written about predicting the performance of an aircraft prior to its construction. Anticipating the performance of an airplane in a larger or smaller size, or of a different wing and fuselage configuration, or even of kits from different manufacturers can add immensely to the enjoyment of the sport by eliminating surprises.

Once we've mastered a basic trainer, most of us want to move to higher-performance aircraft. Good sense tells us that changing from a trainer to a multi-engine scale B-24 isn't the way to go, but much less dramatic aircraft changes can be almost as traumatic! An airplane may look a great deal like a trainer but have very different flying characteristics. For instance, it could have a stalling speed that is the same as the cruise speed of our old friend the trainer and be a real handful to land. Appearances can deceive, so other ways of determining performance characteristics are necessary.

Those who design R/C aircraft do so with a performance standard in mind. Pattern planes, racers and scale aircraft are designed to fly to the standard required of their classes. Pattern airplanes should fly at a constant speed, regardless of attitude, and respond smoothly and predictably to all control input. Racers are for one thing only—going fast. They have minimum movement of the control surfaces because large deviations cause drag and slow the airplane. Scale airplanes are designed to fly like their full-scale counterparts. If the full-scale version is easy to fly, so should the scale reproduction be, and vice versa!

Sport airplanes may differ a great deal in performance. Some fly slowly and others fly quickly—and some do both! They can be as smooth as pattern aircraft or as fast as racers, and they're supposedly designed to meet the flying abilities of the vast majority of modelers. Trainers fall into this category, but it's a very broad



This electric-powered sport model has low wing **and** *power loading combined with a relatively long tail moment arm and large stab. Flies like a powered glider; very gentle on all controls.*

TABLE 1

Some Formulas To Remember

Power loading = Total weight (pounds)/Engine disp. (cubic inches)

Wing loading = Total weight (ounces)/Wing area (square feet)

Wing area = Wingspan x Average wing chord

Aspect ratio = Wingspan/Average wing chord

Average chord = Wing area/Wingspan
OR
Average chord = Square root of area/Aspect ratio

$$\text{Average chord of a biplane} = \frac{\text{Chord (upper) x Area (upper) + Chord (lower) x Area (lower)}}{\text{Area (upper) + Area (lower)}}$$

$$\text{Tail volume} = \frac{\text{Area of horizontal tail}}{\text{Area of Wing}} \times \frac{\text{Dist. Wing L.E. to Stab ¼ Chord}}{\text{Average Wing Chord}}$$

(Measure Inches and Square Inches)

one. Airplanes in the sport class can be anything from powered gliders to semi-bullets.

It's obvious that describing an airplane as a sport model doesn't tell us much about its characteristics, so there must be other ways to compare aircraft. Fortunately, there are several, but there's some arithmetic involved—*easy* arithmetic!

In contrast, this model is 2-cycle-powered, has a relatively high wing and power loading, and flies fast. It may look like a trainer, but can be a handful for the beginning pilot.

Wing loading offers an excellent judging criterion, and should be the first thing to be calculated. Simply, this is how much weight the wing must lift with its area. To arrive at the wing area, multiply the wingspan by the average wing chord (width) and divide the answer by 144 to reduce it to square feet. Next, divide that answer into the total weight of the airplane in ounces. The resulting answer is the wing loading in ounces per square foot.

If the wing has a constant chord and is the same width from fuselage to tip, figuring the wing area is an easy matter. However, if the wing tapers, you must figure the *average* chord. The easy way to do this is to add the chord at the fuselage and the chord at the tip-rib station and divide by two! Other methods are given in the table.

If your trainer is in the 8-to-12-ounces-per-square-foot class, you should be able to safely handle airplanes with loadings up in the 16-ounce-per-square-foot range. But wing loading isn't the only yardstick to consider.

Power loading is also a good criterion by which to judge performance. It stands to reason that if two airplanes have the same size wing and one weighs more than the other, the heavier one will require more power to stay in the air because it must fly faster than the light one. More speed requires more power. Power loading is usually figured in horsepower per pound of weight, but horsepower is difficult to gauge, so we'll settle for the piston displacement of the engine in cubic inches.

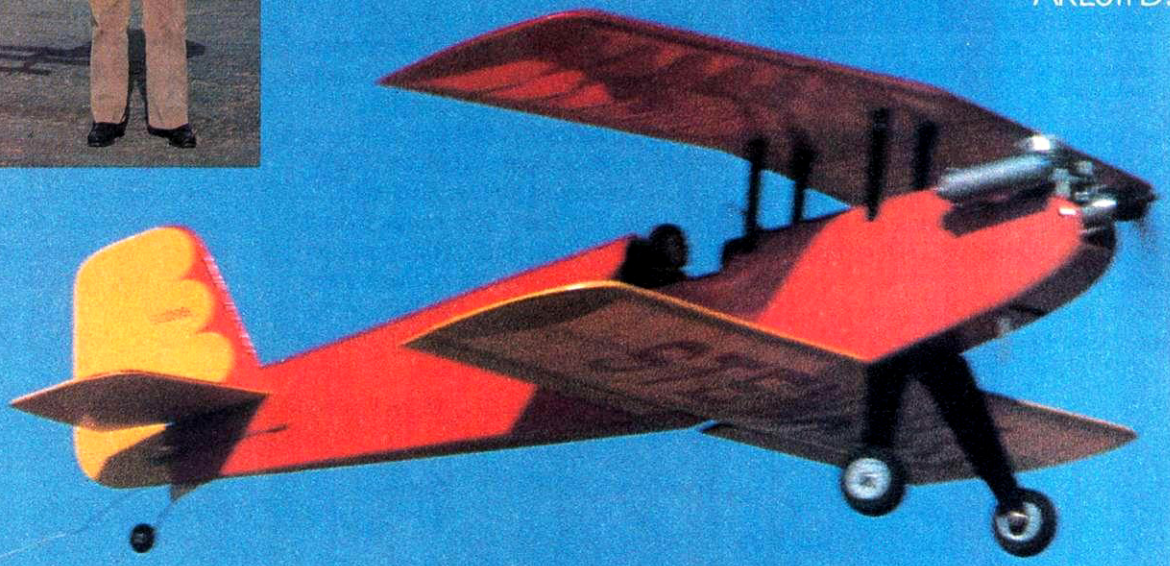
To figure power loading, divide the weight of the airplane by the cubic-inch displacement of the engine. If your trainer has a power loading in the 15-pounds-per-cubic-inch range and you go to an airplane with a *higher* wing loading, the power loading should be correspondingly *lower* in pounds per cubic inches—say 14 or 13 in the above example of wing loading.

There are still other factors that can be used to compare airplanes if you like arithmetic: aspect ratio, longitudinal dihedral, nose and tail moment arms, stab and rudder areas and, the most important, stability and proper balance point.

A formula is given in the table for the tail volume of an airplane. This is based on the length of the tail arm and the area of the horizontal tail. It's a fair judge of stability, and airplanes with similar tail volumes tend to fly similarly.

Now, to finish off this month's column, a flat statement: The fore and aft balance point of a typical radio-control airplane of conventional design should be at 25 percent of the average wing chord aft of the leading edge—That's basic!

A FUEL-SIPPING AEROBATIC TWO-WINGER FOR THE AVIATOR WHO CAN'T GET ARESTI'D!!



STEWART BABY-BIPE

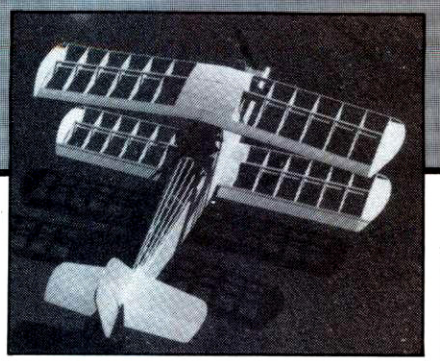
by HARRY STEWART

MOST CONSTRUCTION ARTICLES start with a how-to-build section, but I'll start with a description of a typical flight with the Baby Bipe because, after all, flying is what it's all about.

Taxi out and line up on the center line of the runway; make one last check of the controls; open the throttle. The rudder is effective immediately, and the tail comes right up. Hold it straight, and in about 30 to 40 feet you can ease back on the elevator stick and lift off.

Stow the Baby in your trunk for those impromptu school-yard flights.

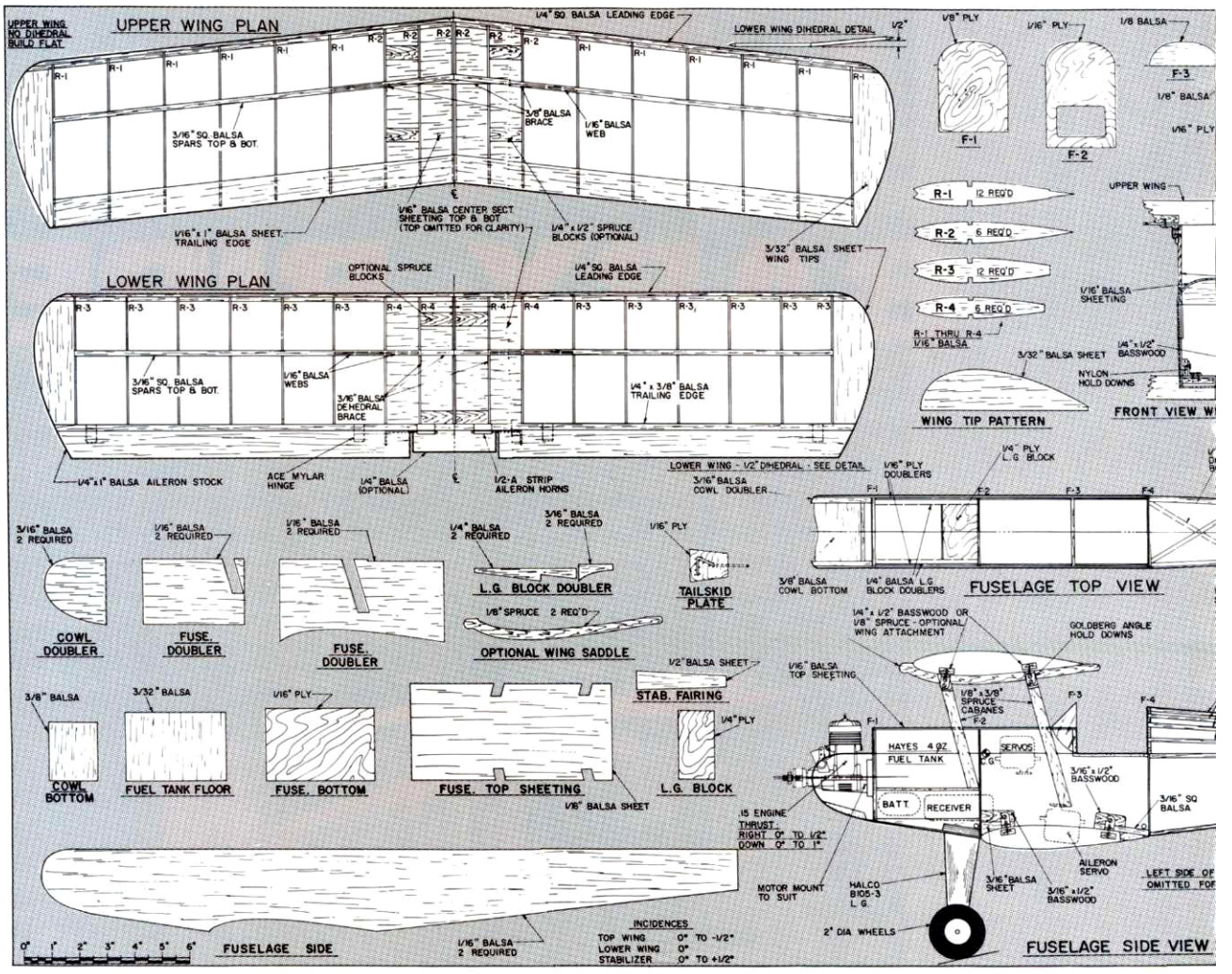
Don't haul back on the elevator stick, but keep the nose down and let the speed build up. Now! Pull vertically... up... up... cut the throttle and full rudder. A perfect stall turn. Straight back down and pull out at about 20 to 25 feet. Now, back down the runway, half-roll to inverted in front of me and fly it down to the end, pushing up into an inverted stall turn with an inverted pull-out at the bottom. Back up the runway, inverted; an outside loop in the middle followed by a

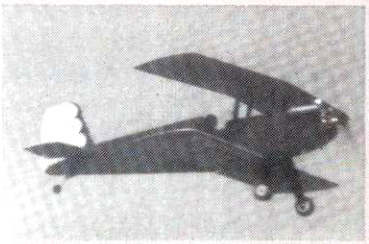


Lightweight structure is key to spritely performance. Transparent covering would look great.

half Cuban eight. Coming back down the runway, roll up onto knife-edge and hold it for the length of the runway. Roll out and pull up into an Immelman. Let the speed build up, then a triple snap-roll, almost faster than the eye can follow. I smile to myself because I know that it's easier to do three than stop it at just one, unless I slow it way down. Continue with horizontal and vertical eights, avalanches, snaps, spins, inside and outside loops and, if everything's just right, a vertical snap-roll followed by a stall turn and another snap-roll back down. After I've done every maneuver I can think of, I slow it down and set up for a landing. Turn final, and adjust altitude with the throttle. The Baby Bipe tracks right in and, with a little flare, it three-points beautifully. Stay on the rudder for the rollout and taxi back. I've been in the air for about 12 minutes, and I've only used about 3 ounces of fuel. Sound like fun? I can assure you, it is!

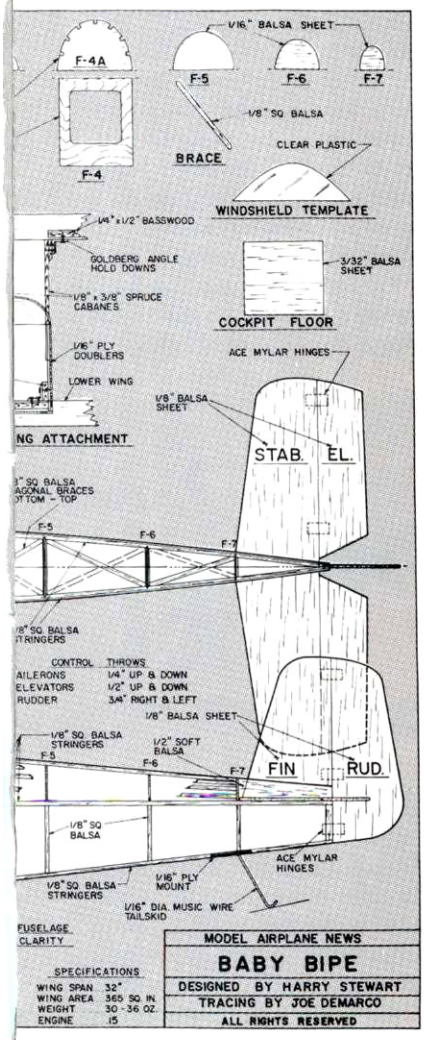
If you'd like to try a Baby Bipe, I have a few general comments before we start construction. First, the old cliche that this isn't for beginners certainly applies. However, it's not only for experts, either. If you can handle most aileron trainers without incident, you can fly the Baby Bipe. Takeoffs and landings, usually tricky with short-coupled airplanes, are very easy. It's really great for trying all those difficult new maneuvers that you might hesitate to attempt for the first time with a



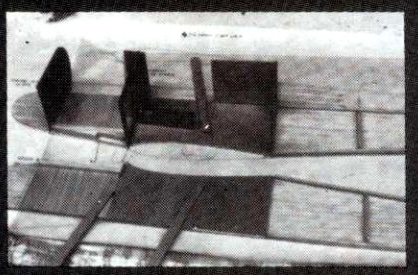


#5881 BABY BIPE $10.50

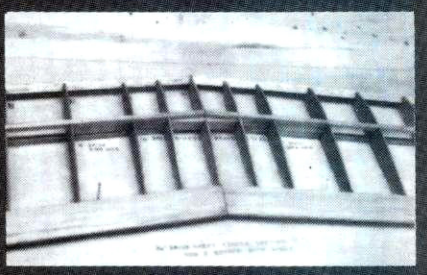
Harry Stewart's .15-powered aerobatic bipe will appeal to the experienced flier who's looking for a performance-packed small biplane with sporty lines. The all-wood construction is conventional and lightweight to enhance maneuverability. With a wingspan of just 32 inches and a weight range of 30-36 ounces, it could have been called "Econo-bipe." Its small size makes transporting it to the field a cinch. Single plan sheet.



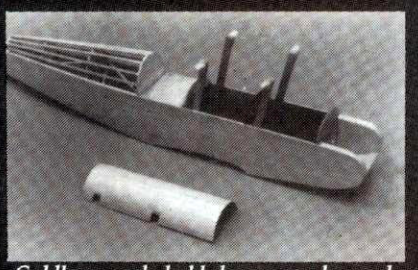
FULL-SIZE PLANS AVAILABLE... SEE PAGE 124.



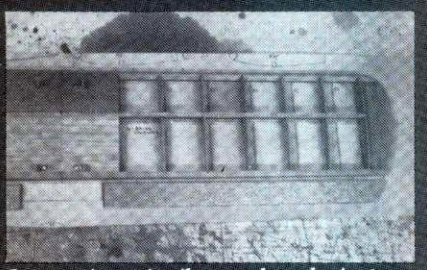
Fuselage sides before joining; note cabanes keyed into doublers.



Upper wing center section shows bracing used at joint. No dihedral required.

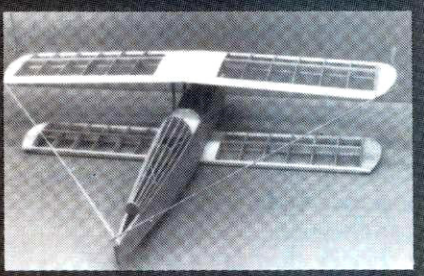


Goldberg angle hold-downs can be used to fasten upper wing to cabanes. Pre-formed sheeting.



Lower wing strip ailerons, shaped prior to covering.

Here too, Goldberg hold-downs are used. Accurate installation is most important. Rubber bands may also be used.

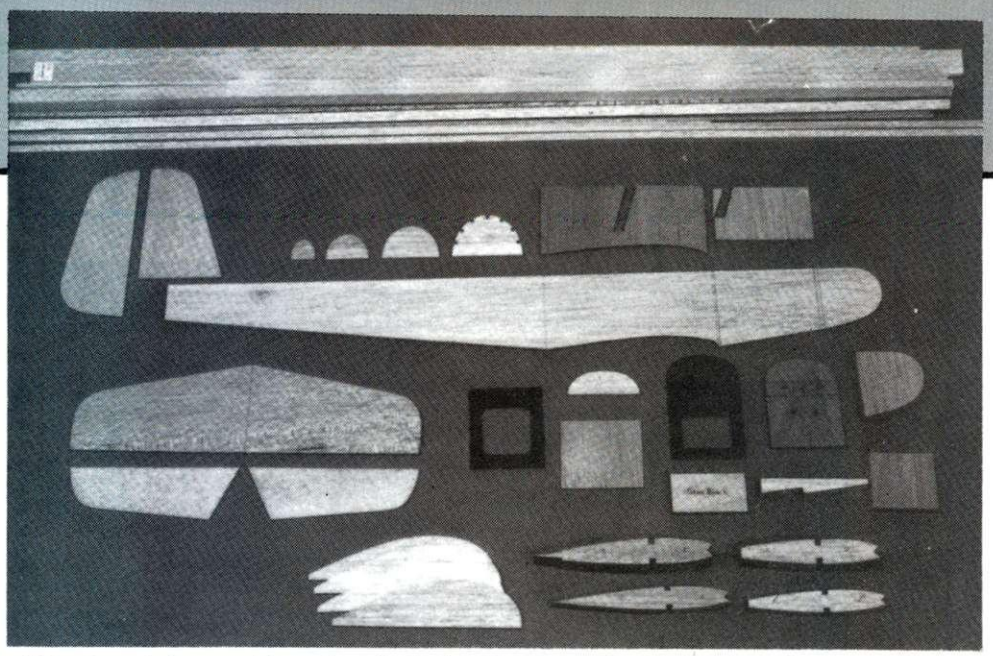


Wing alignment and symmetry is verified by equal length strings.

larger, more expensive airplane. Throw it in your car, assembled; bring your transmitter, fuel, starting battery and quick charger if you have one, and you're ready for those lunch-time, after-work, short-notice, small-field flying opportunities. It does require a lightweight airborne system with smaller servos and a 250mAh battery. But if you're into smaller airplanes, you already have those, and if you don't, perhaps you should give "smaller" a try. In any case, there's nothing small about the Baby Bipe's performance.

Since we're all scratch builders, I know that few of you will follow the plans exactly. That's fine; you have your own ideas to incorporate into your models. Just remember, if you make any modifications, make them for the sake of lightness. The Baby Bipe is more than strong enough and doesn't need any "beefing up." It's designed around a .15-cubic-inch engine and has flown with both the Fox* .15 B.B. and the O.S. .15. The O.S. required approximately 1 ounce to 1½ ounces of ballast in the nose to balance the model. In both cases, the total weight, minus fuel, was less than 29 ounces. While I haven't seen one yet, the O.S. .15 FP sounds great. If you decide to opt for a larger engine (something I don't recommend), just remember that the bigger engine will also be heavier and will increase the wing loading.

Weight, or the lack of it, is extremely important, and especially so with smaller models. Pick your wood carefully, and use CA adhesives throughout. Use the lightest accessories you can find, especially wheels. Be very careful with anything that will be behind the CG. With large models, an ounce here or there soon becomes an extra pound. With small models, a few



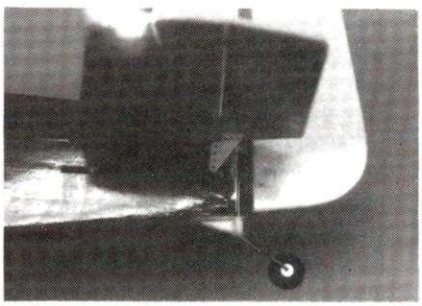
All parts ready for assembly; a piece of cake from here on out. Just like building a kit.

grams here and a few grams there, and you soon have an ounce. Believe me, a couple of ounces on a small model makes a *big* difference to flight performance!

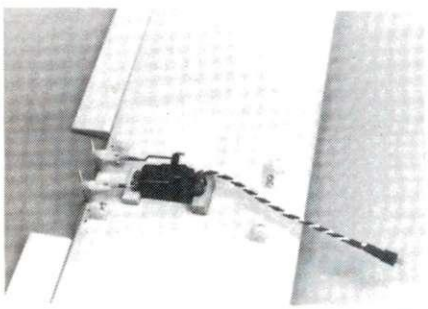
Finally, there are a couple of "options" shown on the plans. These concern the method of attaching the wings and whether to use a tailskid or a tailwheel.

Let's take the wings first. For simplicity, you can't beat rubber bands; they provide a secure hold and have a time-proven break-away capability. Just attach the optional wing saddles to the cabanes and drill the fuselage for the 1/8-inch dowels, and that's it. If you elect to hold the wings on with the DuBro angle hold-down brackets, you free yourself from the after-flight mess of old, oily rubber bands. I first saw these clever little devices used by Eut Tileston to attach wings and used later by Fred Reese on a smaller version of his Golden Oldie. Since precise fit is so important, I don't recommend this method for any but the most patient and meticulous of modelers. I chose the angle hold-downs, but it took me several hours longer to construct, and I'm sure there will be more damage if I crash.

The choice between a tailskid or a tailwheel is a little easier. I originally intended to fly the Baby Bipe from a smooth dirt surface, where the tailskid works well. However, we now fly from a paved surface, so I thought a steerable tailwheel would be practical. In fact, even on pavement the tailwheel offers very little advantage over the skid. Wait until you have an idea of how the Baby Bipe is going to balance before you make a final decision, and only go with the tailwheel if you can stand the extra weight at the tail.



Nylon bracket was used for tail wheel. Note wire keys between rudder-horn mounting plates for reinforcement.



Servo installed in lower wing. Note control arms are set for maximum throw.

CONSTRUCTION: To speed up construction, make a "kit" of all the pieces shown on the plans. That way, you can go from step to step without stopping. Because the parts are so small, you'll find that you'll be able to use your scrap balsa and plywood for most of them. The amount of material you actually have to purchase will be quite small; probably only the fuselage sides, spars, stringers and the leading and trailing edge pieces.

- Tail surfaces. Once the parts have been cut out, the only remaining task is the joining of the elevator halves. Use a 1/16-inch music-wire yoke and sand the halves to shape. Set them aside until you're ready to cover them.
- Upper wing. The upper wing is built as a right and left half which are joined together. The wing halves are built over the plans.

Cut the 1/16-inch trailing edge pieces and pin them down over the plans. Use the lower spar or an extra piece of 3/16-inch square to block up the ribs. Pin it down parallel to and 1 5/8 inch behind the leading edge. Use scrap 1/16-inch strips to block up the R-2 ribs an additional 1/16 inch. Glue all except the two inboard R-2 ribs of each half to the lower trailing edge. Glue the leading edge and the top spar in place. Taper the rear edge of the top 1/16x1-inch trailing edge piece and glue into place. Remove the wing halves from the plans and install the bottom spars. Install the wing tips. Join the wing halves over the plans. Block up the trailing edge so that

(Continued on page 59)

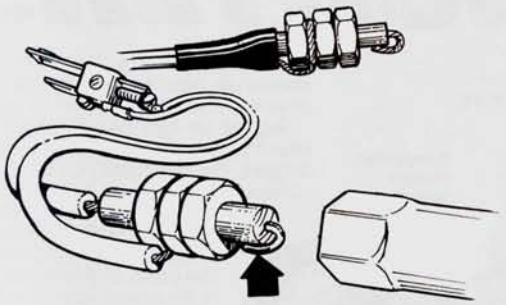
Hints & Kinks

by JIM NEWMAN

PORTABLE SHADE

With the approach of the flying season, we should be thinking about this. Pick up a small beach umbrella with a 9/16-inch or a 5/8-inch shaft. Plug the lower end of the shaft with dowel, drill through the middle and glue in a headless, large nail as a spike. The dowel plug is retained, with a brad rivetted through. Make two holes—one in each arm of the lawn chair through which the umbrella shaft can be inserted as shown.

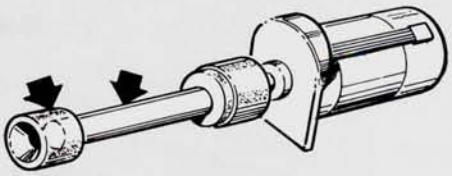
Norman Converse, Marion, MA



1/2A NI-CD ADAPTER

This allows a rechargeable Ni-Cd glow battery to be used on 1/2A engines. A piece of 1/8-inch dowel is reduced slightly to allow three 8-32 nuts to be threaded on. A small hole is drilled lengthways through the dowel, and a piece of copper hook-up wire is bared and inserted through the hole to protrude at the far end. This end should be tinned and then bent over to form the center contact. A second piece of hook-up wire is bared and inserted between two of the nuts for the outer contact. Finally, both are attached to a DuBro No. 149 Kwik-Klip as shown. To lock the nuts, a dab of epoxy is recommended. I also suggest that, to relieve the wires of bends and fatigue, it would be a good idea to jacket the two wires and the dowel in shrink-sleeve as shown.

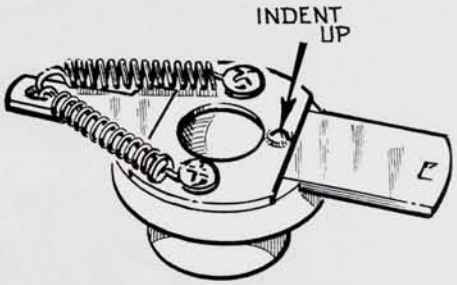
Ralph Carrol, Mabank, TX



HELICOPTER STARTER EXTENSION

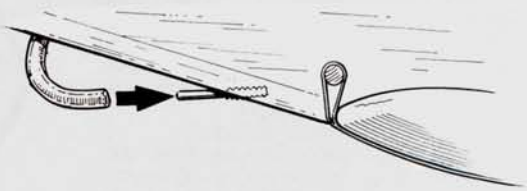
This simple device has been in use for some time with no problems. A piece of 3/4-inch PVC pipe is force-fitted into the starter cup, and a second starter cup, suitable for your helicopter engine cone, is forced over the other end.

Basil Gill, Sparks, NV



SPRING-LOADED CHOKE

Disliking the stay-put choke on his Saito, Bill removed the screws holding the slide retainer down and flipped the retainer over so that the indent is facing up. Replace the screws, add a couple of springs—hardware store variety—then check that the slide moves freely under spring return. The dual springs equalize the load on the slide. *Bill Mitch, Hebron, IN*



FILL-LINE PLUG STOWAGE

To avoid the flapping of the third line or filler tube in the wind, and to eliminate the loss of pressure-line plugs, this plug is a permanent part of the model. This is a simple brass, threaded coupler, such as a DuBro No. 212 or a Hobby Lobby No. HLH809, threaded into the lower nose block with a drop of CA to secure it. The fuel line is merely plugged onto it after fueling.

Bill Skipper, Greeley, CO

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Quiet Flight

by JOHN LUPPERGER

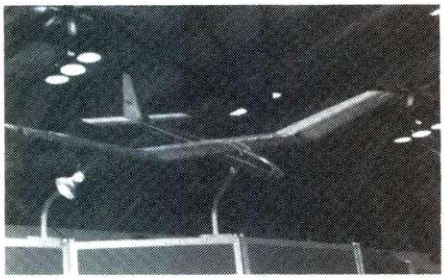
THE FIRST TRADE SHOW of the year, the International Modelers' Show (IMS), took place on January 9 and 10. Held in Pasadena, CA, it got 1988 off to a good start. The IMS is the first opportunity each year for manufacturers to show off their new products, and 1988 looks as if it will be a great year for both electric and glider enthusiasts. There were several new manufacturers, mail order companies and products. "High-tech" models are becoming more commonplace, but good old-fashioned balsa models are still being designed and produced. I'll give you some of the highlights of the products that caught my eye. If I missed anything, I'm sorry, but it's pretty hard to see and report on everything. If any manufacturers want to send me product information, I'll be very happy to pass it on to the readers of *MAN*.

Show Highlights

- Sun Fair Aircraft Designs is a relatively new company specializing in somewhat off-beat, slope designs. Their Slope Master is a 51.75-inch-span aerobatic flying wing. It flies on two channels, using elevons for aileron and elevator control. Its most special features are the three low, vertical fins. I flew one a couple of weeks after the show at Torrey Pines, CA, and I was quite impressed. The model was relatively easy to fly (but the Slope Master is intended for experienced pilots), fast for its flying weight of only 17 ounces and very aerobatic. Rolls were fast, outside loops easy and inverted flight was stable.

Sun Fair's other model, the Slope Dart, is a cross between a bird and a jet. It's a bit smaller than the Slope Master, having a span of only 48 inches, and it should therefore be somewhat quicker. It's also a 2-channel model using aileron and elevator controls. Both kits feature rolled, full-size plans, complete hardware packages, machine-sanded parts, built-up wings on the Slope Master and foam-core wings on the Slope Dart.

Sun Flair's Slope Dart is a cross between a bird and a jet. Compact model will fit in the car fully assembled, always ready to fly. Good way to relax on the way home from work.

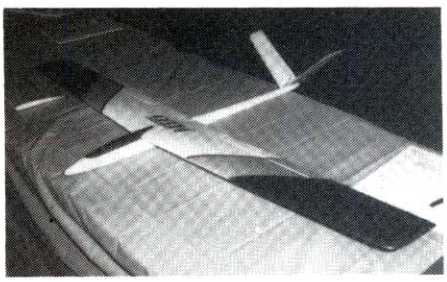


Airtronics' new Eclipse electric sailplane looks like a perfect choice for the novice electric flier. It can be purchased with motor, folding prop and gear drive.

- Airtronics has always been known for its high-quality kits, and any new offering from this company is good reason for excitement. The new Eclipse is an electric sailplane that looks like a real winner. The kit will be offered in two versions: standard model only, or deluxe model complete with motor, folding prop, and planetary-type gear drive. The Eclipse obviously owes much of its design to the Oly 650 and, if it flies anything like the 650, it should be an excellent electric trainer. It's a 3-channel model using rudder, elevator and motor on/off controls.
- Sig Manufacturing Co., Inc. The 2-meter Riser has always been a very popular trainer, so the good people at Sig decided to make it bigger and better. The Riser 100 appears just to be scaled up from its little 2-meter brother, but there are some differences. It sports a new 100-inch-span wing, featuring a modified Eppler 205 airfoil for better penetration and a higher level of performance. The 100 is a 2-channel or 3-channel model using rudder, elevator and optional spoiler controls. The kit features precision die-cut parts, full-size plans, photo-illustrated instruction booklet and a complete hardware package.
- Windsor Propeller Co., makers of Master Airscrew props, has come up with a unique new product—an automatic, full-feathering, adjustable-pitch propeller for 05 direct-drive electrics. The unit comes assembled with spinner, blades, pitch-adjusting screw and adjustment wrench. It's designed to fit motors with ⅛-inch-diameter shafts (most ferrites), and it's recommended for 2-meter-class sailplanes. It should be aerodynamically cleaner than a folder when feathered, giving direct-drive ships a real boost in performance. I have one myself, and I'll let you know how it works in a future column.
- Carl Goldberg Models showed its new, 2-meter Sophisticated Lady and Electric Power Pod. The Sophisticated Lady owes much of its design to both the Gentle Lady and the Electra. The T-tail model has two channels using rudder and elevator controls. The construction is similar

(Continued on page 42)

Goldberg Models has obviously come up with another winner! The Sophisticated Lady offers scale good looks with trainer flight characteristics. A good beginner's model that an experienced modeler can enjoy too.



Flight Concept's Nisus looks hot even when it's sitting still. This small sloper is for those who want to tear up some sky with a really sharp-looking model.

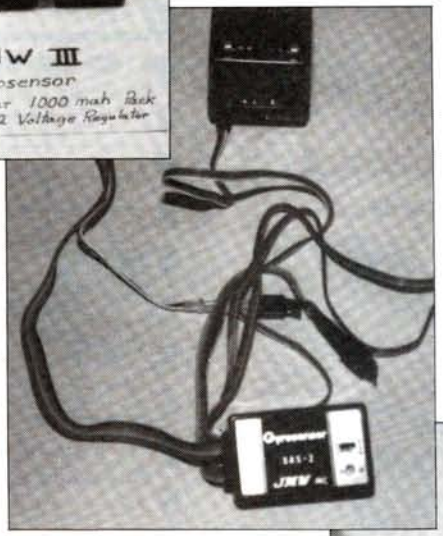
Helicopter Chal

by CRAIG HATH

ARE R/C HELICOPTER pilots the elites of radio control?—Perhaps. At least, I think we're right at the top! But why do I think that! Just consider some of the knowledge that is garnered while earning your wings. Think about the great attention to detail that's required to keep your machine airborne week after week. Finally, ponder the eye-to-hand coordination that flying your helicopter demands. I'm not trying to offend other groups of modelers or trying to blow our group's horn. I just want to point out that unique skills are learned when you become an accomplished model helicopter pilot.

R/C helicopter pilots seem to have the ability to pick up fixed-wing flight rather easily, but this doesn't seem to work in reverse. Many fliers have asked me about learning to fly model helicopters and what they should expect from one. I always respond that helicopter flying is a unique experience which begins as a very difficult process and, in time, becomes quite simple. Further, it never ceases to be a challenge, regardless of the level of proficiency that is achieved.

Are you aware that the three teammates who represented the U.S. at the 1987 World Championships of fixed-wing (airplane) radio-control aerobatics are all accomplished R/C helicopter pilots? Their names are very familiar in R/C pattern circles as three of the very best: Steve Helms, Tony Frakowiak and Chip Hyde. If this surprises you, you're probably not alone. I regularly fly and compete at pattern competitions too, and I feel that my helicopter flying improves my pattern flying because it requires the almost constant use of both hands and intense concentration. So if any of you pattern people out there are thinking about getting started in helicopter flying, remember the benefits. If you're already flying R/C helicopters and are considering taking up pattern flying, you just might have the "right stuff."



Left: *JMW Gyrosensor includes 7.2V 1,000mAh pack, R-522 voltage regulator and connectors.* **Bottom:** *The "brains" of the operation; the gyro and its control box for gain/rate adjustments.*

The Gyroscopic Sensor

The gyroscopic sensor is more commonly known as the gyro. It's a device that has been adapted to assist in the control of the yaw axis in model helicopters. A gyro is of great use to you, because it can be used to speed the learning process as well as to assist you later on as a tool to help keep your flying smooth and predictable.

I admit that my first experiences with a gyro were so frustrating that I gave it up completely and went back to learning without it. At that time, none of the people I was flying with were sure how the gyro should react or whether the thing was even close to being correctly adjusted. Looking back, I realize that I probably had the whole system working backwards! Every time the nose drifted in one direction, the gyro made it worse. This is why I want to pass along some helpful information about setting up and adjusting gyros, so that you can sidestep the frustration and get the full benefit from this most helpful accessory.

Gyro Installation

Having a correctly installed gyro in your helicopter helps to eliminate problems which will appear now and later. The possibility of damage to the gyro from excess vibration is just as likely as is the possibility of damage to the radio receiver

As with any assembly procedure on an R/C helicopter, the routing and securing of the gyro cable should be done with the utmost care and forethought. Note: Cable is secured with hold-downs at both ends of the straight run to keep it from getting fouled with moving parts.

or other radio-system components. The gyro must be solidly mounted to the helicopter so that it may accurately detect its motion. Most gyro manufacturers recommend that the gyro be mounted with a double-face foam tape that none of them (to my knowledge) supply with the gyro.

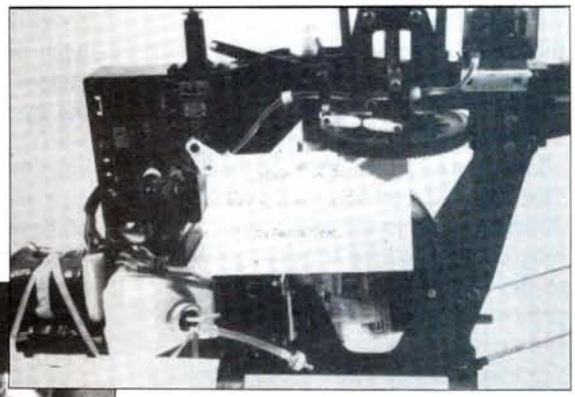
Double-face foam tape is available from most hobby suppliers and hardware dealers. If you have a choice of thicknesses, you'll probably find that ⅛ inch is ideal. When mounting the gyro to the helicopter with this tape, be sure to have the place where the gyro will be mounted clean and free of any oil residue before applying the tape to it. For the best results, wipe the area with a cloth soaked with rubbing alcohol, and apply the tape when the area is dry.

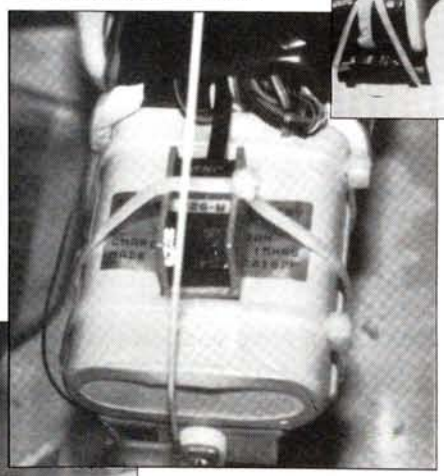
Location of the gyro is also very important. Some helicopter kits are very clear about where the gyro should be mounted, while other kits make no reference to the gyro at all. In almost all situations where there's no mention of gyro location, you can safely assume that the gyro should be placed in the radio compartment just in front of the engine. Try to get the gyro as close as possible to the main shaft, as this is nearly at the helicopter's center of gravity.

The gyro should be mounted on a flat surface with its top facing up. A few of the gyros available have mounting ears, which allow them to be screwed to a surface through grommets, just like servos. This setup works very well as will be shown by the success of the servo. If your gyro has this option, use it.

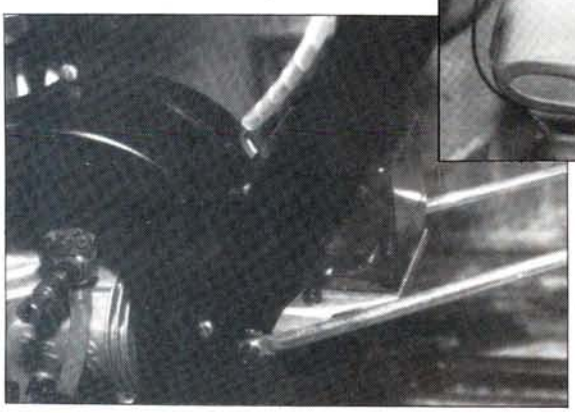
Lastly, gyro orientation. Some world-class competitors are now turning their gyros 90 degrees to the yaw axis. The consensus is that the gyro will not only detect rotation around yaw and make corrections for that, but it will also detect roll rotation and apply yaw corrections for this. This may result in a tendency for the helicopter to be constantly led into a level position.

Most gyros have a control box that houses the power switch and sensitivity adjustments. This is intended to be mounted to the canopy or to a mounting plate for ease of access. The choice is yours, so use your imagination to make a neat installation. Whenever you need to route cables from one gyro component to another, be sure to secure the cable where it won't ever become exposed to any moving part, or have its insulation rubbed off against any sharp edge. Some slick items that you can use for this job are plastic cable-ties with eyelets for mounting with a screw. These ties are available from electricity-supply houses and hardware stores, and they come in a variety of sizes.





Right: *Good installation has gyro as close as possible to main shaft; unit faces up on foam tape—away from dust, dirt and exhaust.*
Bottom: *If single battery is to be used for both radio and gyro, it's a good idea to use a higher-capacity pack like the one shown here; 1,00mAhs or more.*



Left: *In this instance, the gyro is located just in front of the engine and is well protected by frame members. Again, it's well away from exhaust and dirt. Note mounting plate and screws.*

Batteries

Some gyros will give you the option of using a separate battery pack for the gyro. This is helpful because of the extra drain the gyro places on the battery. Using a separate battery pack also allows the use of a slightly higher-voltage battery, and this can increase the responsiveness of the gyro. If you're considering this, please check with the manufacturer of the gyro ahead of time to ensure that using a higher-voltage battery won't damage the gyro or the radio system. In most cases, the high-voltage extra battery is 7.2V and has a capacity of 1,000mAh coupled to a 5V voltage regulator. If you're only using one battery pack for your radio system and gyro, you must use at least a

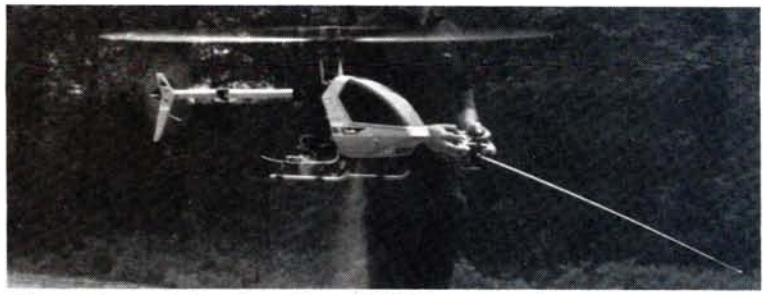
1,000mAh battery to compensate for the extra load. Using the 500mAh battery that is included with most radio systems won't allow much flight time between charges, and this is hazardous because the battery voltage drops very quickly.

Adjustments

Most gyros can be adjusted in three ways. There are different methods for making these adjustments. Here are the details:

- Reversing. This feature allows the gyro to be mounted conveniently in the helicopter without regard to the direction of operation. When the gyro is ready to use, test for direction of operation and move a switch to reverse the gyro if the operation isn't correct.
- Neutral sensitivity. This adjustment is usually a small screw slot at the base of the gyro, which is turned to neutralize the gyro while changes in the in-flight sensitivity are being made. As a result, the gyro won't make changes in tail-rotor servo trim while you're changing sensitivity at the transmitter. This adjustment is normally performed by moving the sensitivity selector at the transmitter back and forth, while turning the screw slot and watching the tail rotor servo. This process is very delicate and proper completion requires patience.
- Response sensitivity. This adjustment allows you to set the gyro for the desired "feel" and it corrects any excessive or deficient input to the servo. Some gyros may be adjusted for response sensitivity at the transmitter. When this feature is present, the gyro is said to have "in-flight sensitivity selection." Regardless of whether or not the gyro can be adjusted at the transmitter, all gyros (to my knowledge) can be adjusted to tailor servo response. This is the final gyro adjustment and must be completed after flying the helicopter.

Begin setting the response sensitivity by following the manufacturer's recommendations. In most cases, the manufacturer gives a good starting point for your particular gyro. Be sure that you'll be able to reach the trimmer pot (potentiomer) or pots for response sensitivity when you install the gyro. Most gyros have a separate case which houses these pots and which can be mounted in an easily accessible place. If you're able to adjust the response of the gyro at the transmitter, set one of the sensitivity trimmer pots to full clockwise, and set the other to full counterclockwise. For the JR gyros (which all feature in-flight sensitivity) set the No. 1 trimmer pot to full clockwise, and set the No. 2 pot to full counterclockwise to give you the most range of response.



The gyro has made learning to fly an R/C helicopter much easier. This has naturally brought about an increase in popularity. Thank you, Mr. Gyro!

Flying

Lift the helicopter into a hover, and hold it there. If you're just getting started, practice lifting the helicopter off and gently landing it. Pay attention to the tail rotor. With the gyro turned off, check the tail-rotor trim to make sure that the tail rotor is properly adjusted before you attempt to fine-tune the gyro. With the gyro switched back on, hover the helicopter until you understand what the gyro is doing for the tail-rotor system. If you're a beginner, you'll want the gyro to lock the tail rotor so that it won't drift away from you. You'll also want the tail rotor to correct itself when a gust of wind causes it to move, etc. A lot of these principles also apply to the expert flyer, but some may want a softer feeling for the tail rotor and some may prefer a tight tail rotor. Whatever you want, at that level, most gyros will accommodate you.

If you notice that the tail rotor is "swimming" while holding the helicopter in a hover, you'll have to decrease sensitivity until this swimming action stops. This is accomplished by turning the response sensitivity pot counterclockwise just a little at a time and re-checking until the tail rotor holds steady in a hover. One method of being sure that you have the maximum gyro response which your system will handle is to gradually increase the response sensitivity until the tail rotor begins to swim, and then back it off just to the point where the swimming stops.

If you're confused about the reference to the "swimming tail rotor," I'll explain that this is the result of the gyro response being set too high. When this happens, the tail-rotor servo is being sent signals, and these tell the servo in which direction to move the tail-rotor blades so quickly that it can't keep up. This will cause the tail rotor to move back and forth like the tail motion of a fish.

It's possible that your particular system will never be able to reach this point. If this is the case, you must rely on your own judgment about the feel of the tail rotor with the gyro switched on, and adjust it accordingly.

The opposite of too much sensitivity is not enough. If you have a situation where the gyro response rate is turned all the way up, and the tail rotor still doesn't lock in, you might not have enough mechanical servo throw, or the servo that you're using on the tail rotor might be responding very slowly. First, attempt to correct the problem by moving the tail-rotor linkage out on the servo arm away from the center of the servo. A good starting point is about ½ inch from the center of the servo output. Fly the helicopter again, and adjust according to the above instructions. If you don't get satisfactory results, you could purchase a high-performance servo for your radio system. This servo features a faster servo-travel time. These specifications should be available from your radio manufacturer. At any rate, the gyro will help you much more if it can stop the tail rotor quickly and hold it still in a hover while you concentrate on other things!

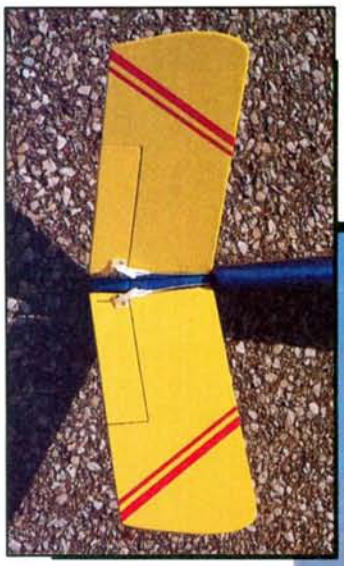
Well, that's about it for now. One final tip for experts: If your gyro is capable of selecting sensitivity at the transmitter, you might want to have this feature connected to the retract channel or the other switched channel. Set one trimmer pot for the response you desire for hovering, etc., and set the other pot to zero response. Now you'll be able to switch the gyro off for aerobatics (and, especially, inverted flight) without having to land the helicopter and then flip switches while it's on the ground. Next month, I'll start on collective pitch set-up as we continue our quest for the "perfectly trimmed machine."

These Vee-tails for the small

G • M • PRECISION

Bumble OR Killer VEE

by CHRIS ABATE



Left: *Common to both kits is the unique Vee tail.*
Below: *Low-angle shot of the Killer Vee shows off its racy, clean lines.*

IF SOME say, "bigger is better," then I must say smaller is neater. I say this because here I'll be talking about GM Precision Products'* Bumble Vee and Killer Vee—a two-in-one review of small neat kits.

The two aircraft have totally different looks and flight envelopes. If you haven't guessed it, both models are what we refer to as 1/2As. Both readily accommodate either glow engines or electric power packages, and the V-tails make for an interesting design.

CONSTRUCTION: Parts for both planes are nicely machine-cut and are not die-crunched. The hardware packages are complete with all the usual parts, such as hinges, control horns and wheel retainers. The printed plans are rolled, not folded, and this is most appreciated. The instruction books are easy to understand and, as I mentioned earlier, show both the electric and glow installations. The instructions contain numerous photos showing key construction sequences.

I chose glow engines for both aircraft. Even though the Bumble Vee is a high-wing plane and the Killer Vee is a low-winger, both are very easy to construct.

Their fuselage sides are 3/32-inch balsa and are pre-cut to

"" are bonanzas too... plane flier!

outline. Both have three major bulkheads, one being the firewall. When the bulkheads have been glued to one fuselage side, this is then put over the top view of the plan and the other side is added. This sequence ensures a straight and twist-free fuselage.

After removing the assembly from the building board, the additional steps to complete the fuselages are performed. The stabs are V-tails and are solid ⅛-inch sheets, which are very simple to construct.

When you construct the wings, you'll really be impressed with the machine-cut parts. The ribs are clean-cut with no frayed edges. On the Killer Vee, all shear webs are pre-cut, as are the ¼-inch square balsa trailing-edge spacers. Nice touch! In the construction of both wings, the trailing edge is placed on the plan, and several ribs are used to set the spacing. Position the lower spar, add the remaining ribs, the center sheeting and the pre-shaped wing leading edge, which is made of spruce, as are the two spars. This basically completes the wings, which are then cut along their center line at the root ribs. Root ribs are angle-sanded to the correct dihedral, and the wing panels are then glued together. Construction was straightforward because the instruction sequence was correct, and each step flowed logically into the

The giant of the East points to the approximate location of the CG on the Bumble Vee. Using the plans is much more accurate!

next. I had one problem when building the Bumble Vee wing. The trailing edge material, both wing spars and the leading edge material were all a ¼ inch shorter than specified on the wing plan. I compensated for this by moving the outboard ribs in slightly.

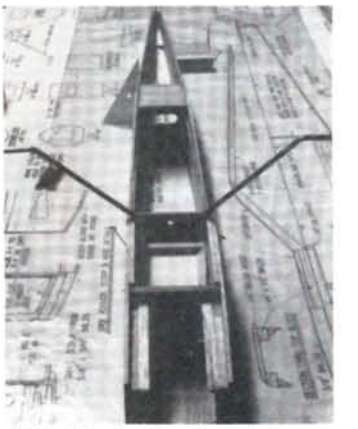
Next, let's talk about radio installation and power plants. The Bumble Vee needs only two servos for operation, both being used for flight controls. No servos are needed for the motor, since a Cox* .049 Black Widow (non-throttle) was used. The Bumble Vee has no ailerons, so the V-Tail acts as an elevator and rudder all in one. This is easily accomplished by using the DuBro* mechanical mixer, and I highly recommend that this unit be used.

The Killer Vee, while also having a V-tail, doesn't need a mixer because it has ailerons. Instead of using two servos here, I used three. I selected an O.S. Max .10 as a power plant, and the third servo was employed for throttle control. In either case, no matter which way you set up your aircraft, I recommend that you use a 4-channel radio and not a 2-channel radio. Even if you only use two servos, in my opinion it's easier to fly with elevator and rudder/ailerons on one stick. Even if you're a beginner, you may one day need full 4-channel capabilities.

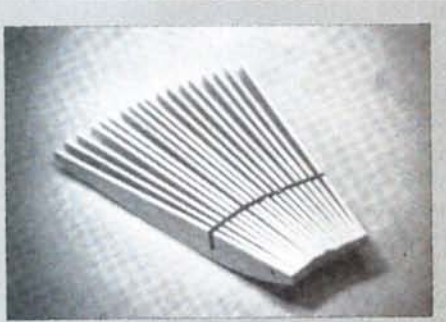
I covered both Vees with iron-on-type coverings. The color scheme on the Bumble Vee is representative of what you'd find on a General Aviation airplane at your local city or county airports. Neat, clean and traditional—a conservative look with just a touch of accent. The Killer Vee, on the other hand, conveys an aerobatic, racy impression. My daughter, Jennifer, even got in on the fun by designing the Killer Vee logo. Covering of both Vees was done with iron-on-type covering. The Bumble Vee was done with Top Flite* Super MonoKote, and the Killer Vee was done with a combination of coverings. The wing was covered with Super MonoKote and the fuselage with Coverite's* Black Baron metal flake. Logos, as well as all numbers, letters and wind screens, were cut from MonoKote trim. Pinstriping was done with Goldberg's* striping tape. The only preparation needed is a thorough sanding and vacuuming. Take your time with this; it will pay off in the end.

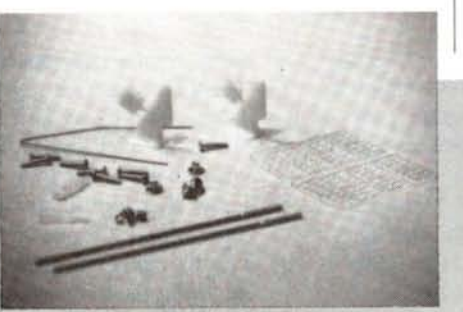
PERFORMANCE: This was just as I'd anticipated. The Bumble Vee was slow but stable (almost trainer-like), and turns were wide and slow. In contrast, the Killer Vee, with the O.S. Max .10 up front, was quick and snappy. Both models were hand-launched. No attempt was made to take off from roll-out, as attempting that with no ground steering would be asking for trouble. Let's face facts: the manu-

O.S. 10FP with variable-volume muffler was used in the Killer Vee. No shortage of power.

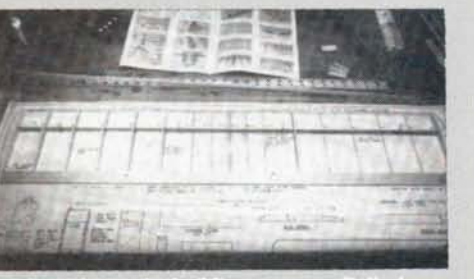


Killer Vee fuselage inverted over plan. This ensures twist-free structure.

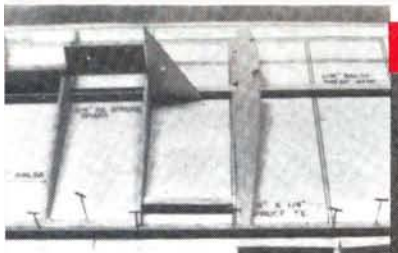




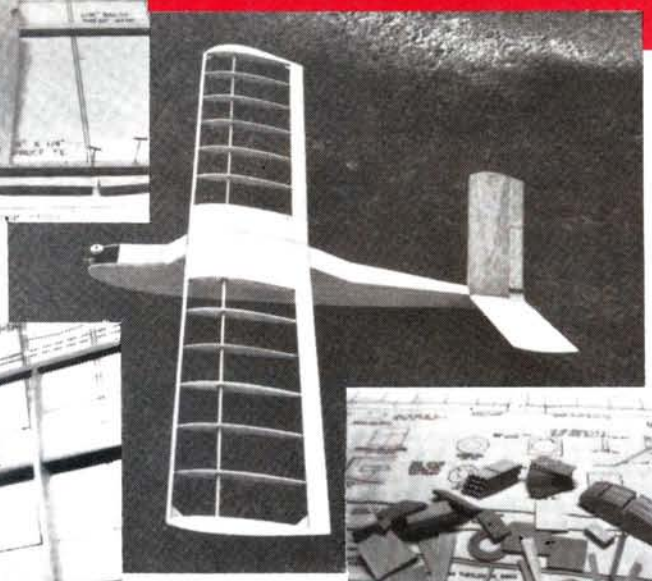
Left: *Cleanly cut ribs make building the wing enjoyable.*
Above: *Kit hardware pack includes horns, hinges, clevises and other bits and pieces.*



Wing shown in building process. Full-size plans and illustrated construction manual are helpful to less-experienced builder.



Pre-cut T.E. reinforcements ensure accurate rib spacing.



Wing-tip block before shaping. Note triangle gussets between tip rib, and leading and trailing edges.

Above: *Bumble Vee framework sanded, just before covering.* **Right:** *Nice array of cleanly cut wood parts.*

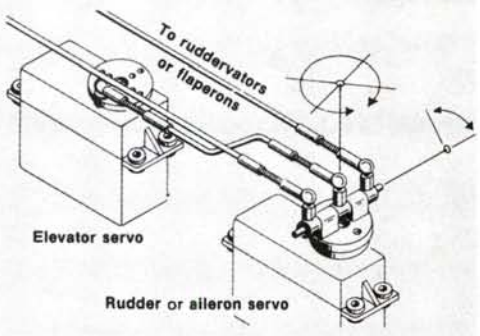


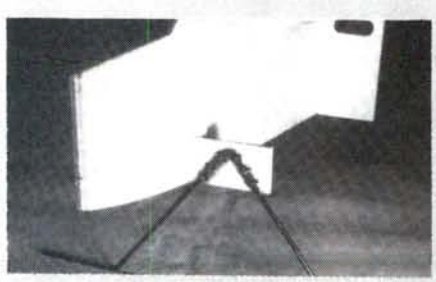
Diagram shows linkage hook-up for ruddervator on Bumble Vee using DuBro mechanical mixer.

facturer had hand-launching in mind when he designed both kits.

I was truly impressed with the machine-cut parts in both kits; ease of construction is important. One modification that I made was to add a 1/16-inch ply plate to the bottom of the wing on the Killer Vee, so that when I tightened the wing bolt it would seat against the ply plate. This may be overkill for this size of aircraft, but I felt better doing it.

If you're an experienced builder, a couple of evenings will have either aircraft framed up and ready for final sanding. If you're a beginner, just follow the instructions. Build and fly the Bumble Vee first, as it's generally acknowledged that high-wingers seem to be more forgiving. I had fun with both. Give one or both a try. I'm sure you won't be disappointed.

There's good news for those who like slightly larger models. GM Precision Products has scaled-up both of these kits, and the results are the Bumble Vee 20 followed by the Killer Vee 40. The number in the name denotes the recommended engine size. Looks like they've discovered a winning formula. Could this mean that a Quadra-powered Killer Vee is imminent?



**Here are the addresses of the manufacturers mentioned in this article:*

GM Precision Products, Inc., 510 E. Arrow Hwy., San Dimas, CA 91773.

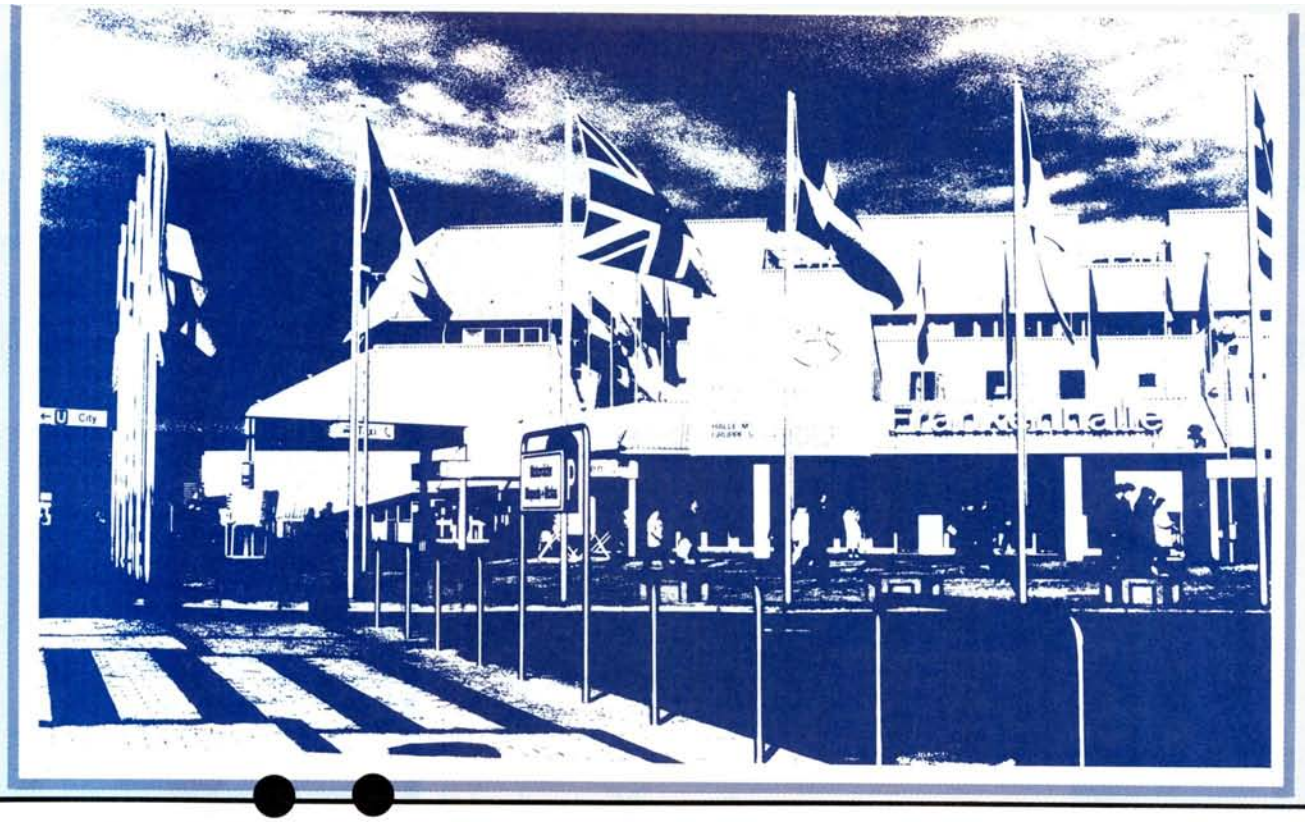
Cox Hobbies, 1525 E. Warner Ave., Santa Ana, CA 92705.

DuBro Products, 480 Bonner Rd., Wauconda, IL 60084.

Top Flite, 2635 S. Washash Ave., Chicago, IL 60616.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Carl Goldberg Models, Inc., 4734 West Chicago Ave., Chicago, IL 60651.



NÜRNBERG MISSION

by CHRIS CHIANELLI

THOSE OF YOU who've been to a trade show—and I'm sure that most of you have—know that these shows can have both good points and bad points. Imagine, if you can, the largest show you've ever seen, where English, Japanese, French, German and Italian can all be heard in the time it takes to walk from one large booth to the next; and the only *bad* point of this show is that it must eventually end. That's the Nuremberg International Hobby Show!

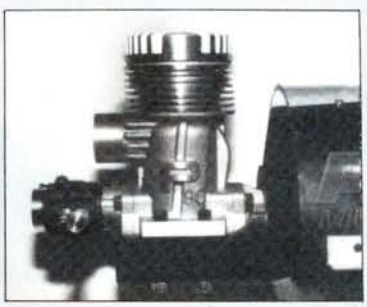
If one had to sum up this show with only two words they would surely be: "totally professional"! The R/C section of the show was in a sprawling, ultra-clean building. This was, for the most part, devoid of the obnoxious human traffic jams at every video monitor and booth with a pretty girl that are so common at the other shows I've attended. This show didn't lack pretty girls; in fact, there were more at this show than I've ever seen anywhere, but the show was so well laid out that the traffic always flowed well. Those responsible were determined not to jam too many booths into one space, so leaving only just enough room in the walkways to gain the approval of the fire department. Even the food was good—exemplary—when compared with other trade show epicurian "delights."

The best parts of a show like this are getting a first look at new products that are still top-secret in the States and meeting all the individuals behind the products. I show photographs of some of the newest products, and these *will* be available in the United States. This is exciting, but it's heartbreaking to see provocative-looking products and to know that many will never be available here.

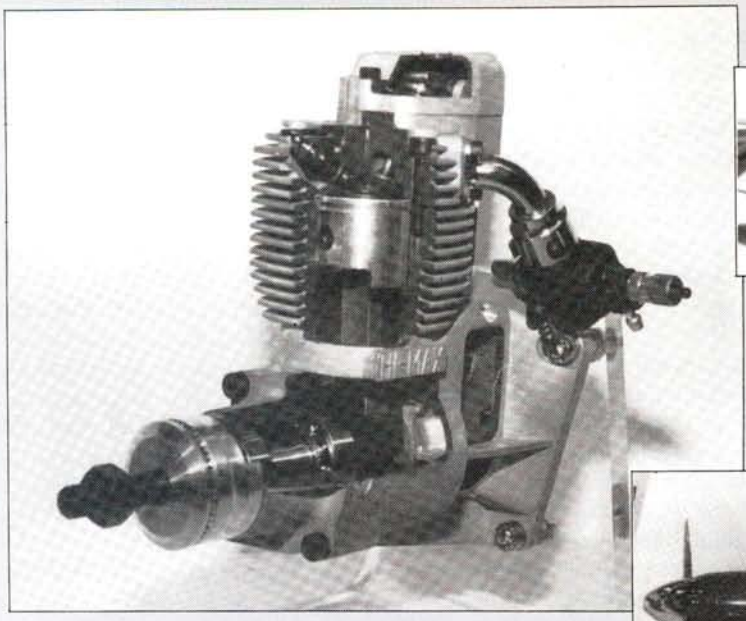
It's great to meet the people behind the products—people you haven't seen in a long time or have only known by phone or mail. I met Herr Graupner, Hanno Prettner, Paldo Pergher of Scorpio Models and the Takamatsus of the very successful EZ line of ARFs.

From the train ride between Frankfurt Airport and Nuremberg (replete with plush dining-car amenities) to the schnitzel in old Nuremberg, the entire trip was without disappointment, and I'm left with many memories that will be with me for a lifetime. But, just to be sure I don't forget, I'm going again next year! ■

The "Surpass" name is now attached to two new O.S. 4-strokes, this one being the all-new .91.

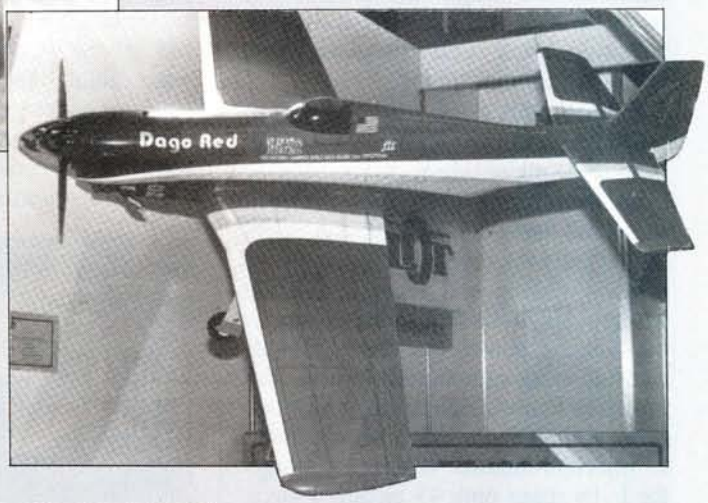


This new Picco .90 fan motor should be a strong performer if it's anything like its slightly smaller brother, the .80.

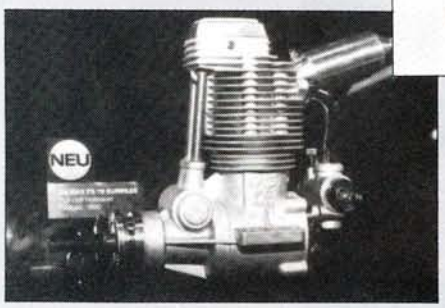


Left: *The lightweight (28 ounces) Hi-Max 1.20 4-stroke will be imported by Hobby Lobby International. To the eyes of this 4-stroke nut, everything looks right on this English-made engine.*
Above: *The .40- to .60-size (.60 to .90 4-cycle) EZ PT-19, shown here at the Sport Aviation booth.*

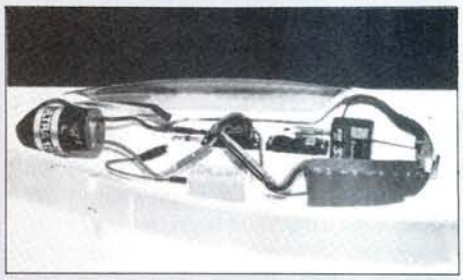
I know fan enthusiasts would love to see this gorgeous Bauer ME-262 make it to the States; uses two Bauer fans.



The striking Dago Red modified Mustang Reno racer also made its debut at Nuremberg. This EZ looks the best yet when it comes to color matching with the ABS parts and the rest of the aircraft.



Left: *Here again, O.S. is letting the world know that 4-strokes are anything but dead with the new "Surpass Series." This latest addition is the Surpass 70.*
Above: *The latest "Series 87" 60 Super SPA RCA, FAI 84 comes with slide-valve carburetor.*



Graupner is out to make its mark with high-performance electric sailplanes. Here we see the heart of the ASW 22 B 3-meter ship. In the nose is the incredible 12-pole Ultra 1200 motor.

Aling Lai of Thunder Tiger proudly holds his new, and as yet unnamed, helicopter.

The all-balsa Graupner Fokker D VIII attracted lots of attention throughout the show. Will be imported by Hobby Lobby.

The Eurofighter: a hand-launched delta wing .15- to .20-powered fun machine will make it to the States.

(Continued from page 28)

to that of the two aforementioned models, and the wing is the same as the Electra's. The fuselage shape is reminiscent of many modern gliders. The model comes with a clear canopy and a pilot figure. This is one of the prettiest 2-meter trainers available and should prove to be very popular.

Goldberg's new Electric Power Pod uses the same motor-flight system as their popular Electra. Designed to operate on six or seven cells, the Power Pod will fit the Sophisticated Lady, the Gentle Lady and most 2-meter gliders that have rubber bands on their wings. This will probably sell well, as it will allow most 2-meter gliders to become electric gliders with few, if any, modifications.

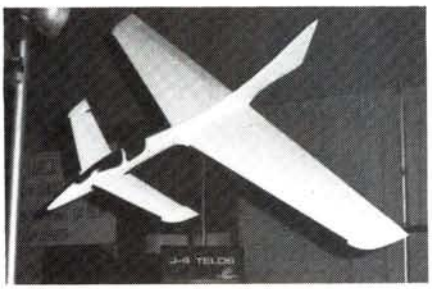
• Combat Models is a new company producing a new and unique, all-foam, F-16 slope glider. The F-16 has only six main, foam components, a few pieces of wood and hardware. Building the model should take no more than a couple of hours. Finishing and radio installation will probably take four times as long as the building phase! The model is a 2-channel, using aileron and elevator controls. The foam is high density and much stronger than that which is usually found in injection-molded models. Although the F-16 spans only 47 inches, it has a wing area of 434 square inches and is bigger than you'd think. It's supposed to be capable of a broad speed range and is quite aerobatic. As the manufacturer states, "It's a fighter pilot's fighter." Rumor has it that their next model will be an A-10 Tank Buster.

• Flight Concepts showed two new models: the F3B Eagle and the Nisus slope soarer. The Eagle is an all-glass, carbon-fiber-reinforced F3B model for the serious competitor. The wing uses a Selig airfoil (Flight Concepts didn't want to say which one) and is stressed to 24 Gs! It will sell for somewhere in the range of $600 to $700.

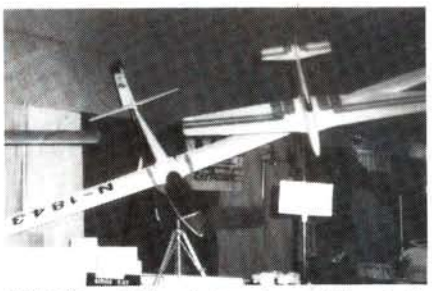
The Nisus is a 1.5-meter, 2-channel slope soarer using aileron and elevator controls. The manufacturer calls it a "slope rocket" and, if looks are any indication, I'll bet it is! This really looks like the perfect model for those who want to tear up some sky. The kit features an epoxy fiberglass fuselage, obechi-sheeted foam wings, machine-shaped tail surfaces, complete hardware package, detailed plan and building instructions.

• Eldon J. Lind Co. has been around for quite some time and so has its Magic Magnet Builder. This magnetic building board really makes building fast and easy. Now E.J. Lind has come up with a new accessory to facilitate the building of semi-symmetrical and symmetrical wings. Their new, stepped, magnetic triangles allow you to support both the leading and the trailing edges and so build straight wings every time. We all know how important it is to build straight models, and the Magic Magnet Builder and its accessories should make that easy.

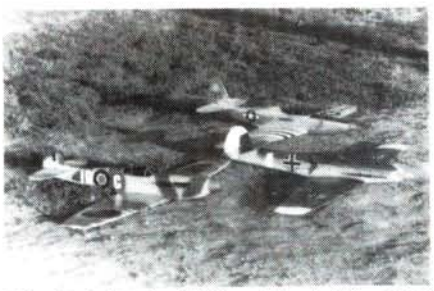
• American Sailplane Designs is a new company headed by Gary Anderson. It specializes in the sale of sailplanes, electric models and related products. It has a 36-page catalog featuring slope, thermal and scale sailplanes; all types of electric models; flight systems; specialty hardware; flight boxes; winches; retrievers, etc. It's a glider-guider's wish book, with something for everybody. And, best of all, these are all American-made products! That means instructions in English and manufacturers who can be easily contacted if you want to ask about their products. I think you'll find this company worth looking into.



The Telos is available from American Sailplane Designs. This classy-looking canard features a glass fuse and foam-core wings. Definitely a model that will turn heads wheneer it flies.



ASW 17 and Penetrator slope glider; both available from American Sailplane Designs.



Brian Laird's trio of PSS models. Spitfire, P-39 Airacobra and Me-109. Small, fast and aerobatic. Designed specifically for Bluff Cove site and able to stand up to high winds and rough landings.

After leaving the IMS, I decided to visit one of the best-known hobby shops in Southern California—Wilshire Model Center. It's always a pleasure to see what's cooking at Wilshire. They carry an extensive line of glider and electric products from Europe and the USA. If it's a high-performance model you want, Wilshire's got it. The new proprietor, Robert Ratzlaff, is continuing the tradition of stocking the best models available from overseas. However, the main reason I stopped at Wilshire was to check out the new books on model aerodynamics. Wilshire carries the MTB books on airfoils, electrics and modeling techniques. Although the books are in German, they do convey information that any modeller can understand through drawings, pictures and graphs. The MTB airfoil books cover information on NACA, Eppler and Quabeck profiles. These are definitely worthwhile additions to anyone's library. They also have Martin Simon's new, revised edition of Model Aircraft Aerodynamics. Simon is one of the foremost authorities on full-scale sailplanes and model aerodynamics; his book is used as a text in many colleges. If you want a better understanding of why your model does what it does, this is the book to have. (By the way, it's in English.) I've only read the first couple of sections, and I'm amazed at how much I've learned already.

Model Of The Month

On a recent Sunday drive along the California coastline, I came across a slope sight where fliers really enjoy Power Scale Slopers (PSS). There were F-16s, F-20s and a trio of World War II PSS models flying. The flying site, known as Bluff Cove, is a high cliff overlooking the Pacific Ocean. The cliff produces excellent lift, but it doesn't have a landing area where pilots can stand. The landing area is to one side, lower than the flight area and on the other side of a small gulley. If that weren't enough, the landing area is only about the size of a baseball-diamond infield. As you can imagine, the models take a lot of abuse during landings. Watching these guys hit that landing zone as I stood in the pilot area was quite a treat. However, not every landing is as good as the ones I saw that day.

That's where Brian Laird and this month's model (or should I say models?),

(Continued on page 76)

MANTZ

by DON SKILES

The making of a legend.

MANTZ

Foreword by
BOB ALLRED

THE MAY 1985 issue of Model Airplane News *featured my article, "My Times With Paul Mantz." Those were truly magical and exciting times. I was lucky to know Paul for nearly two years. He often sent me on errands—all aviation or aero-movie associated. My photos reflect the feeling of this time when I knew him (1950-52). I was a young commercial pilot, and my flying career was much influenced by this legendary airman.*

I've always felt that a major motion picture about Paul Mantz just had *to be produced. Well, now it's in the works. I'm lucky, not only to have known the late Paul Mantz, but also to be a contributor to this film project. It was exciting just to talk to Paul and, in the near future, we can all look forward to witnessing his legendary exploits once again on the big screen. He was a fine American aviator and a terrific guy.*

Paul Mantz with "The Smasher." Famous camera ship N.A. B-25.

MAJOR MOTION PICTURE history is being made in San Francisco by a dynamic film production group that fuses the best young film-making and aviation talents with seasoned professionals. The Pacific Wave Film Production Group, Inc., is preparing to bring a legendary aviation figure's story to life.

The film's central figure, Paul Mantz, is no stranger to readers; he appeared on the cover of this magazine several times during his life. As the title, "Hollywood Pilot," reflects, it will capture the magic of two of the most spectacular industries of our time.

Pacific Wave is ideally suited to filming Paul Mantz's fascinating life, as it's headed by Greg Mantz, Paul's grandson. Greg has vivid, colorful memories of his famous grandfather. Not many can say they actually heard the greatest precision flyer of his time talk about his exploits. He was a man who flew with the best and daily hobnobbed with Hollywood stars.

Operating from the Group's main office in San Francisco, Greg Mantz has a large production team at work on the picture. Each of the partners—M. Gregory Mantz, David Lambert, Jeffrey Land, William Black and Bill Dussel—contribute extensive professional and business experience. The Group currently boasts operating centers in San Francisco, Newport Beach, San Diego and Heidelberg, West Germany, and is closely linked with major figures in both the film and aviation worlds.

"Hollywood Pilot" is generating tremendous support and enthusiasm from both the aviation and film communities. Bringing a fresh approach to the business of film-making, Pacific Wave is taking an exciting story and developing it into one of the most important film projects in many years. To ensure a film worthy of its subject, the five partners have aligned themselves with "the right stuff"—some of the most creative film-making talent in the industry, as well as many important aviation historians.

Northern California has a rapidly growing film community. (Lucasfilms, among others, is centered in the area.) Already teamed up with some of the area's best talents in aerial cinematography, film production and writing, Pacific Wave is also tapping the area's experts to develop vigorous, aggressive marketing and distribution channels for the project.

In two years of preliminary work, solid preparations for the film have been made. The primary production team has assembled extensive resource and background material, including scrapbooks, film clips, flight records, numerous publications and personal accounts from those who knew Mantz or worked with him.

In addition, screenwriters are drawing on first-hand accounts of Mantz's fabulous career from his own logs and diaries, which have been provided by his wife, Terry. Extensive film and aviation archival materials from studios, and collections from several air museums are also on hand.

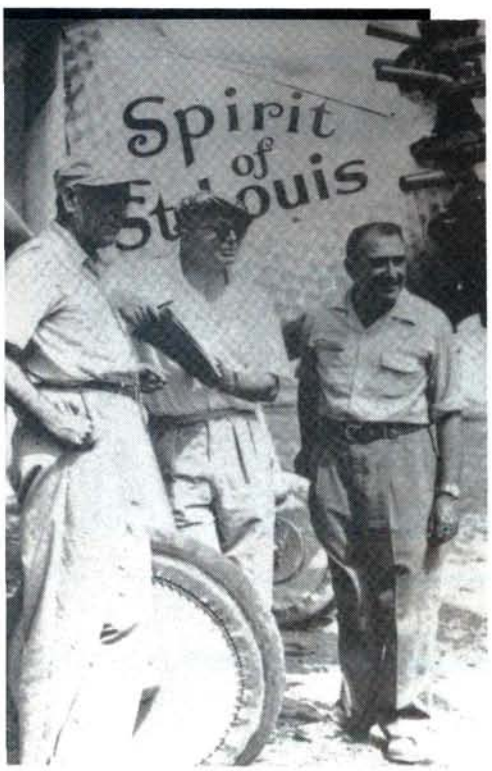
To promote the film, the Group has developed a variety of visual supports. Noted artist, Philip Castle of London, England, has been commissioned to produce promotional posters that will be made available to interested aviation enthusiasts. Advance copies of Castle's artwork for the film, which is in the style of the logos that bomber crews painted on their B-17s during World War II, are stunning and evocative.

The Group is also working closely with the San Diego Aerospace Museum, whose President, W.T. Immenschuh, and Director, Ed McKellar, have fully endorsed the project and have offered the use of the Museum's extensive archives. Working with the Museum, the Group is now producing a television documentary based on Paul Mantz's life, and this is scheduled for

airing by PBS early next year.

The documentary will introduce Mantz's career and story to a wide audience and will probably whet their appetites for more information. "Hollywood Pilot" will provide it. In addition to its aviation history interest, the Paul Mantz story is full of glamour, danger and romance. The Hollywood film community is recognizing the great commercial potential and appeal of a project which captures the sparkle and vivacity of one of its most fabled eras and some of its greatest stars—Cagney, Gable, Bogart and James Stewart, all of whom Mantz doubled for.

Broad-shouldered, with a neat, pencil mustache, gleaming black hair and a generous smile—a handsome man who looked the part of the ace pilot—Paul Mantz bore an uncanny resemblance to Clark Gable, who was his close friend for years. In leather flying jacket, whipcord trousers and flying boots, Mantz fit the image most people have of the dashing, fearless aviator, a king of the sky.

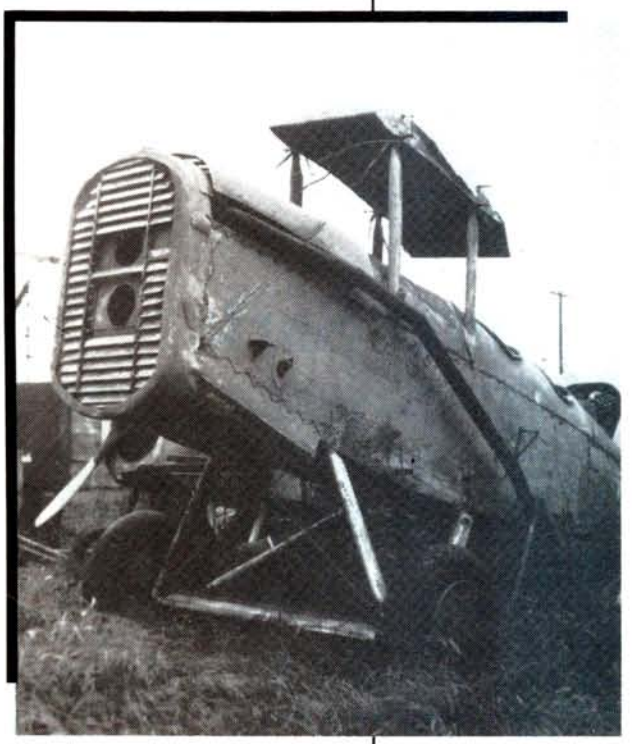


Producer Leland Hayward, Director Billy Wilder and Paul Mantz during filming of "Spirit of St. Louis."

Not only did he personify the image of the ideal pilot, he lived it daily. Mantz's daring, consistent, flawless execution of aeronautical maneuvers was exceeded only by his remarkably astute technical understanding of the craft he flew and the limits of their performances. In this sense, he was a *precision*

(Continued on page 79)

In center is the Vought 02U used in the movie, "Task Force," with Gary Cooper and Jan Wyatt. This collection was "off limits" to almost everyone.



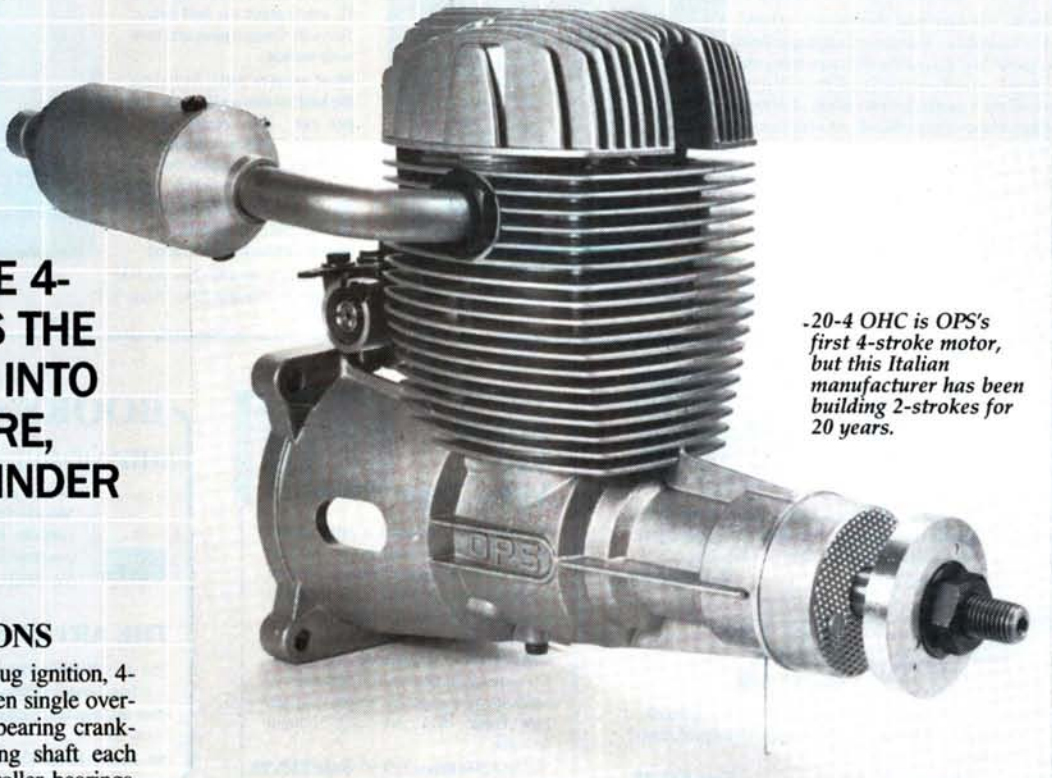
Another of Bob Allred's photos. Shows a DeHavilland DH-4 (used in many air epics of the 1930s) and a barely visible Thomas-Morse Scout.

Engine Review

OPS 20-4 OHC

by PETER CHINN

THIS UNIQUE 4-STROKER IS THE OPS ENTRY INTO THE BIG-BORE, SINGLE-CYLINDER MARKET.



20-4 OHC is OPS's first 4-stroke motor, but this Italian manufacturer has been building 2-strokes for 20 years.

SPECIFICATIONS

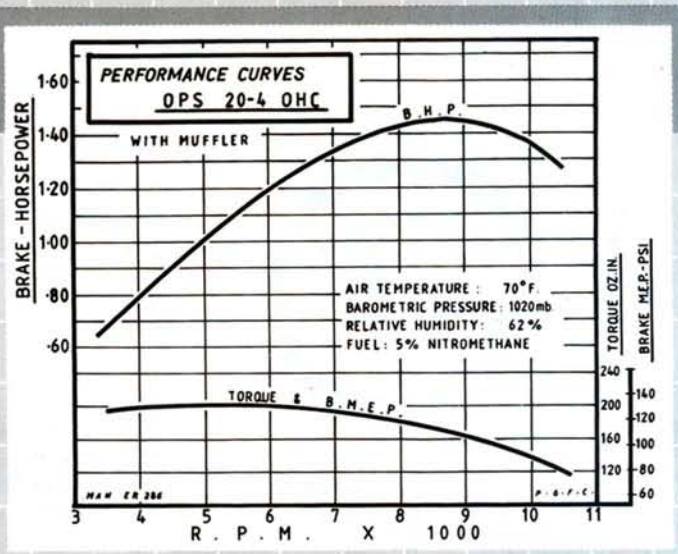
Type: Single-cylinder, glow plug ignition, 4-stroke-cycle with belt-driven single overhead camshaft. Twin ball-bearing crankshaft. Camshaft and timing shaft each supported in twin needle-roller bearings. Slide-throttle-type carburetor with automatic mixture control.
Checked Weights:
1,097 grams (38.7 oz.) including muffler.
1,063 grams (37.5 oz.) less muffler.
Displacement: 19.704cc (1.202 cu. in.)
Bore: 32.0mm (1.260 in.)
Stroke: 24.5mm (0.965 in.)
Stroke/Bore Ratio: 0.766:1
Nominal Compression Ratio: 7.3:1
Performance Data—as tested:
Power Output, Net: 1.45bhp at 8,800rpm
Torque, Net: 202 oz.-in. at 5,500rpm
Equivalent b.m.e.p.: 132 lb./sq. in.
Specific Output, Net: 1.21bhp/cu. in.
Power/Weight Ratio, Net: 0.60bhp/lb.
Manufacturer: OPS s.r.l., 20041 Agrate Brianza (MI), Italy.
U.S. Distributor: Shamrock Competition Imports Inc., P.O. Box 26247, New Orleans, LA 70186.

SOME ENGINE BUFFS are going to look at our performance curves for this engine and say: *"Only 1.45bhp at 8,800rpm? Wasn't it claimed to deliver 2.1 at* 12,000?" Frankly, this doesn't really matter. The OPS 20-4 OHC will fly the sort of model *for which it is intended* very well, without having the potential to reach 2hp at 12,000 rpm.

It's a characteristic of internal combustion engines that a high specific power output cannot be divorced from a high crankshaft speed. But, in a model aircraft power unit, it's just as important that the engine produces enough torque to turn a prop that will generate the thrust required to fly the aircraft effectively and efficiently.

In other words, in the absence of a gearbox, through which a high-speed low-torque output (at the crankshaft) can be converted to a moderate-speed high-torque output (at the prop), we have to compromise. We have to sacrifice some of the engine's high potential in order to satisfy aerodynamic requirements.

On test, OPS 20-4 OHC produced above-average low-speed torque and proved best on big props.



Performance curve shows peak BHP at 8,800rpm.

OPS is distinctively different in both appearance and design. Belt-driven overhead camshaft operates inclined valves; carb is slide-throttle type.

Of course, there are some types of models for which very high operating rpm are well suited (small racing planes and ducted-fan models in particular, as well as racing boats and cars). However, model aircraft engines usually have to be propped for speeds below those at which they produce their maximum power. This is especially so in the case of 2-stroke-cycle engines, where, for example, an engine with a bhp peaking speed of 16,000rpm or 17,000rpm, may, of necessity, be fitted with a prop that limits its full-throttle rpm to 12,000 or so.

The same is now beginning to apply (but at lower all-round rpm levels) to 4-stroke engines. Modern model 4-strokes reach much higher specific power outputs than those of ten years ago. Relative torque levels—more easily observed when one compares brake mean effective pressure (bmep) values—are higher, but bhp peaking speeds are also higher, and it may be necessary to accept substantially reduced full-throttle operating rpm in the interests of using larger props. This is particularly so when one wishes to make use of the 4-stroke's natural suitability for scale models.

To some extent, an exception can be made in the case of 4-strokes used for FAI Class F3A pattern aerobatic models. Here, a light, aerodynamically clean aircraft can use a smaller prop to release more of the engine's top-end power. It seems that this is mainly where the discrepancy arises between the original factory specification for the OPS 20-4 OHC and the actual performance characteristics displayed on testing.

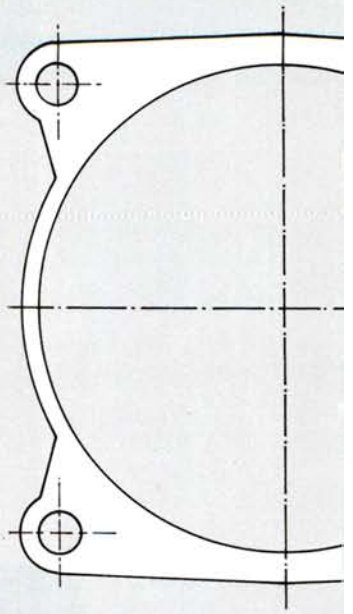
In the instruction manual now issued with the production engine, it's revealed that OPS began by designing an engine intended for F3A contests. However, during the testing and development of the production engine, OPS

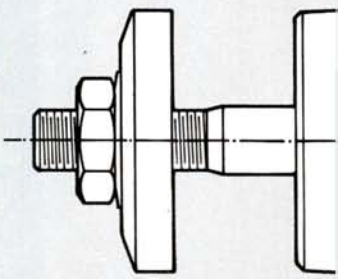
Unusual one-piece body casting has fins cut away at back for drive-belt clearance. Prop drive assembly includes both tapered collet and Woodruff key.

Camshaft drive parts. Timing shaft (center) with bottom pulley and backplate (left). Drive belt with camshaft pulley (right).

Conrod has uncaged-type needle bearing at lower end. Piston is short-skirted slipper-type. Brass cylinder sleeve has chromed bore. All parts photos taken after tests.

Cylinder head (right) with camshaft, rockers and one valve removed. Head cover (left). Special, long glow-plug clip (center) is installed from side between fins.





distributors and individual customers requested, instead, a reliable, powerful engine with power at medium rpm, the capability of turning large props, a low and reliable idle and easy starting qualities for the "fun flyer."

OPS agreed, realizing that 4-strokes had yet to make any decisive impact on the continuing popularity of 2-stroke engines in the F3A category, and would probably not do so until judges appreciated the more realistic aerobatics that 4-stroke-engine models are capable of carrying out.

Accordingly, the development of the OPS 20-4 OHC was directed away from the pursuit of maximum power at high rpm, and towards achieving improved performance in the 5,000rpm to 9,000rpm range when fitted with a suitable muffler.

The OPS 20-4 OHC is different from its competitors in the 1.20-cubic-inch single-cylinder 4-stroke class. It's an SOHC (single-overhead-camshaft) engine and thereby dispenses with timing gears and pushrods. A toothed belt connects a toothed pulley on the crankpin-driven timing-shaft (at the rear of the crankcase) to another pulley on the rear of the camshaft which is carried in bearings above the cylinder head. Rocker arms, mounted on each side of the camshaft, are then used to transfer movement from the cams to inclined valves.

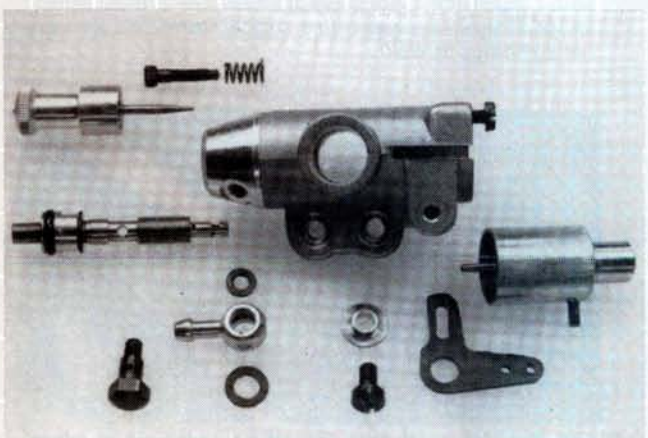
COMPONENTS: The engine has a distinctive appearance and is for firewall-type mounting only. Let's look at its component parts:

- Main casting. Of pressure-cast aluminum alloy, this embodies the crankcase, extended to the front to contain the main-bearing housings and to the rear, to end in a 4-point radial mount, plus a full-length, finned, cylinder jacket. The cylinder portion has twelve elongated cooling fins. The fins don't completely encircle the cylinder; instead, they have a horseshoe form, i.e., they're cut away at the rear to accommodate the camshaft drive belt.
- Crankshaft assembly and bearings. The long, slim, 12mm-diameter crankshaft runs in an 8-ball, 12x28mm ball-journal bearing at its inner end and in an 8-ball, 9x24mm ball-journal bearing at the front. The crankshaft features a T-type crankweb with a separate, hardened, pressed-in crankpin that includes a 4mm-diameter spigot which drives the timing shaft.

At its front end, the shaft has a keyway for a 3mm Woodruff key which engages the widened slot of a brass split-taper collet, rather than engaging the prop driver itself. The prop driver is an aluminum pressure casting, and it has a 34mm-diameter, serrated drive face. The front

(Continued on page 96)

Camshaft and rocker parts. Steel rockers operate on bronze shafts. Pulley is molded, glass-filled nylon with aluminum hub and is keyed to camshaft with roll pin.



Parts of OPS slide-throttle-type carburetor. Needle-valve, spray-bar assembly and banjo union (left); throttle slide with automatic mixture-control needle and bellcrank throttle link (right).

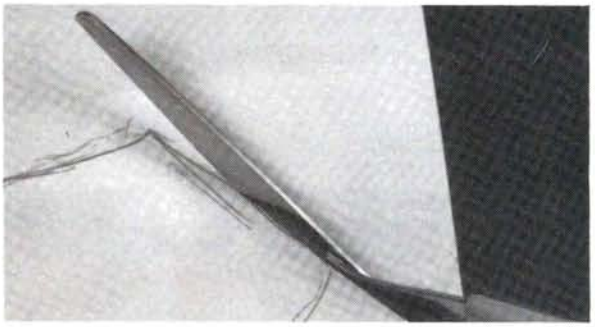
How To:

by RANDY RANDOLPH

TRIM TEMPLATES

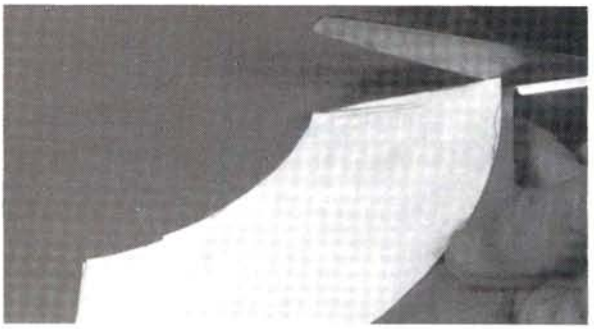
The appearance of all airplanes benefits from the application of trim and cabin details. The photos show a way to cut trim outlines easily and accurately. Although a windshield from contrasting film is shown in the photos, the technique applies to any trim.

1. First, hold a piece of bond paper in place on the airplane, and draw a rough outline of the windshield. Accuracy is not too important in this step; just outline the general area to be covered.



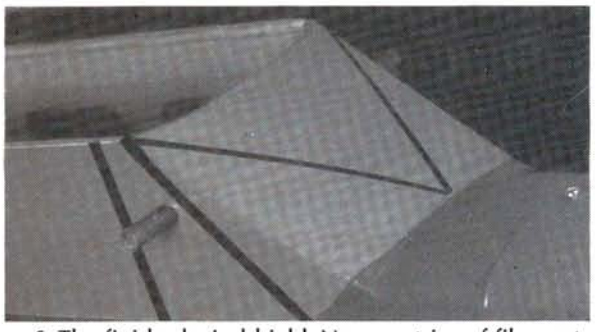
2. Cut around the drawn outline, and fit it to the fuselage. This is the time for accuracy. Fit and trim it to the *exact* shape of the windshield.

3. When the paper pattern is correct, rub the *front* side with a glue stick. Glue sticks are available at most hobby shops, drug stores and office-supply stores and are very handy things to have.



4. Glue the template to the *backing sheet* of the film to be used. The glue holds the template firmly against the backing sheet and makes accurate cutting a snap. Scissors work well here. Strip the backing from the film after it has been cut to shape.

5. Position, and then iron the windshield in place. When working with film over film, always iron from the center toward the edges. The use of a sock or cloth covering on the iron also helps to keep air bubbles from forming between the layers.



6. The finished windshield. Narrow strips of film, cut with the use of a straightedge, add to the effect.

Field & Bench Review

ROYAL 25 Cherokee P·D·Q

A down-sized version of the popular Piper; ideal for the intermediate flyer.

by RICH URAVITCH

Type: *ARF Sport Scale*
Span: 52 inches
Weight: *3¾ inches*
Area: *468 square inches*
Power Required: *.25-.40 2-channel, .40-.46 4-channel*
Suggested Retail Price: *$129.95*
Features: *Pre-decorated foam sheet over wood. Complete accessory pack.*

THE PRESENT ROYAL PDQ line of ARFs is small, encompassing only four different designs. Interestingly enough though, the four offered seem to have been chosen to meet a specific need, since they're all different, either in size or in type.

For the sport-pattern enthusiast, the Telstar is offered in both the .25 and popular .40 engine sizes. Ditto for the sport-scale aerobatic Chipmunk. Using the .40 engine, but in the high-wing, sport-scale family is the Cessna which we reviewed in the December '87 issue. Downsizing again to the .25 displacement engines, we find the subject of this review, the Cherokee 25. Something for everyone!

CONSTRUCTION: The Cherokee follows the now widely used method of sheet-foam-over-wood substructure fabrication. The color and markings are built in and rendered completely fuelproof by a layer of clear material which is permanently bonded to the foam skin. It's easy to keep clean because it has *no open foam pores.* Like most of the ARFs that employ this type of material, the Cherokee assembles quickly and accurately, but it will probably not be the easiest to repair, and this may or may not be a consideration in your purchase. If it is, you might be interested in reviewing the ARF repair techniques that we talked about in the June '87 issue of *MAN.*

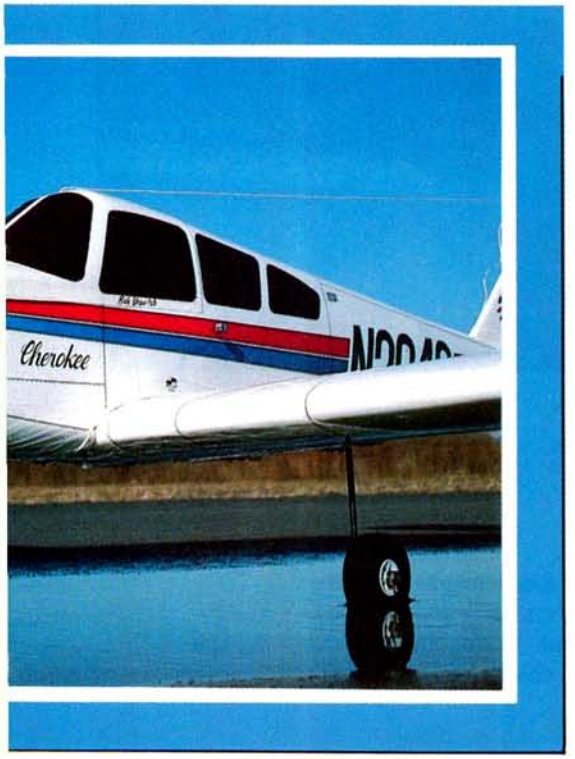
The Cherokee kit contains nearly everything you'll need to complete the model except the usual radio, engine, prop and adhesives. It's about as complete a it as you'll find, and it even includes wheels, collars, pushrods and spinner. Also in the box is a 7-ounce fuel tank! If you use a .25 as I did, this tank will provide enough fuel to keep you airborne for a half-hour at reduced power settings!

All the hardware is provided, including some of the nicest clevises I've seen in *any* ARF kit. The trash can in my workshop is usually the final repository for what I consider to be the substandard molded

parts usually included—Not so with this Cherokee! Whoever supplies the Taiwanese molded parts should be applauded, as they're great!

Assembly of the kit is adequately covered in the 12-page instruction book, which uses line drawings rather than photos to depict construction. Two evenings should be all that's required to have the little bird ready for radio installation. I found two glitches in the instructions: the recommendation to attach the plastic fin to the stabilizer fairing *before* securing the fin, and an inaccurate illustration. The first makes it more difficult than necessary, and I suggest that you reverse the sequence by attaching the fin before the fairing. The other glitch is the illustration that shows the rudder pushrod exiting the right-hand side of the fuselage (same side as the elevator pushrod) when it belongs on the left-hand side. Everything else was as described, and no other problems were encountered.

The motor mount employs two plates to which the engine is first attached, and this assembly is then bolted to the mount. The system allows a variety of engines to be easily accommodated. Royal recommends a .25 to .40 2-stroke or a .40 to .46 4-cycle.

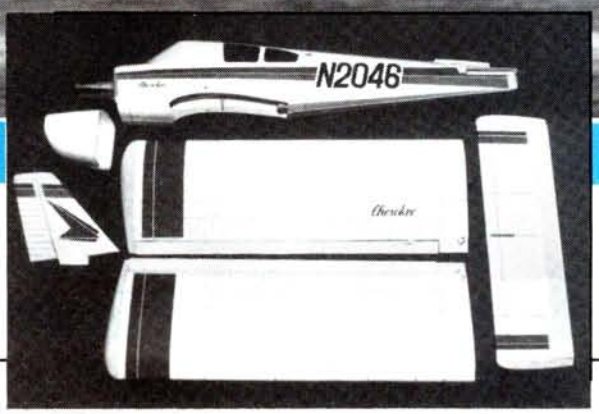


Unless you "feel the need," I'd avoid a 2-stroke .40. With 468 square inches of wing area, the Cherokee has less wing than a Quicky 500—thicker, to be sure, but still rocket potential! Although I didn't physically check it out, installing a .40 might be a shoehorn fit also. Since it *is* called a Cherokee 25, I installed an O.S. 25FSR with stock muffler, figuring that would be the size powerplant which most modelers would choose. Very uncomplicated... upright mounting, accessible needle valve and fuel lines. Not the most aesthetic "fully cowled," slipper nose area, but not offensive either and, after all, it *is* a sport flyer.

To guide the little Cherokee around the patch, I installed my trusty "old" World Engines* MK IX Expert, which had just come back from the factory following a frequency-change operation. Cincinnati was much closer than Denmark!

There's enough room in the fuselage for three standard S-21 servos, a 500mAh pack and the receiver, so nearly any radio should fit with no problem.

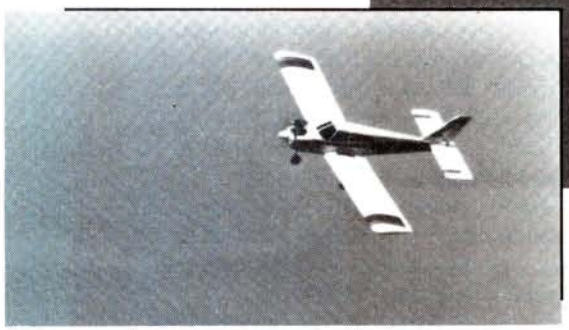
Completing the assembly involved the application of the Mylar trim pieces, and these include the windshield, side windows, wing walks and cowl trim. The Mylar is OK, but I'd prefer to see it a little thinner, especially on the windshield pieces which must negotiate compound curves. Its



All major parts as they come out of the box replete with panel lines.

thickness causes them to "pucker," but this is easily remedied by gently slicing them with a sharp X-Acto knife. To seal the edges, I brushed on two coats of clear K&B* Superpoxy around the edge of the Mylar.

A final alignment check was accomplished, and I verified that I had the proper control-surface throws as shown in the instructions. That completed the building portion of the project, so now it was on the charger and prepare to head for the flying field.



Above: *The Cherokee waits for clearance.*
Left: *The little Cherokee has great sport-pattern performance plus a scale appearance.*

PERFORMANCE: The weather for the test-hops couldn't have been better! Just a mild breeze blew, but it was blowing straight down the runway.

After a few minutes of pit chatter with some of the guys, whose comments ranged from "cute" to the expert's comments that there was "too much airplane and not enough engine," I fueled it up (7-ounces worth, remember?), and had the O.S. idling smoothly in no time. Taking the active for some taxi and acceleration checks disclosed that

the nose-wheel steering was a bit sensitive for my liking, but this was manageable until we could reduce the throw. Applying power gradually, the Cherokee accelerated smartly, a clear indication that the choice of engines was perfect. Throttling down, we taxied back to the end of the runway for that first takeoff. I've done this many times, but there's always *some* apprehension. Re-applying power had the machine rolling down the runway and airborne in about 30 feet in a smooth, steady climbout. Gaining some altitude, we first looked at the stall qualities which were very, very gentle. We later discovered that the Cherokee could be flown easily at zero ground speed in a slight headwind. We tried some mild aerobatics next and found that the rolls were smooth and more pattern-like than scale when full aileron was employed. As the saying goes, "Loops is loops!"; as large or small as you command with no tendency to snap out at the top.

The real fun came doing landing approaches and touch-and-gos. Never leaving the pattern, we just tooled the little Cherokee around, flying left- and right-hand approaches, setting up a right sink rate with throttle and, most of the time, touching down "right on the numbers." Back on the power, we were airborne again for still more circuits. I *knew* there was a good reason for that 7-ounce tank! This was pure, unadulterated model aviatin' *fun!* We packed up that first day with five flights logged, and were convinced that the Cherokee was a perfect little airplane for simply enjoying the fun of R/C flying on a smaller budget. Even our "expert" was impressed, confiding that he really *did* know that the .25 would be more than enough power.

Our Cherokee 25 now has 18 flights on it, some of them by fliers still accustomed to basic trainers. They seem to get comfortable with it quickly but, because it's a bit on the rapid side and doesn't have a lot of dihedral, I wouldn't recommend it as a first (or maybe even second) R/C airplane. For those who are comfortable with low-wing models and aileron models, or who appreciate good sport performance in a smaller package, the Royal Cherokee deserves a closer look.

**Here are the addresses of the companies mentioned in this article:*

World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241. ■

BABY-BIPE

(Continued from page 24)

the chord line of the ribs is parallel to the work surface. Butt-glue the spars and leading and trailing edges and install the spar joiner. Add the four center R-2 ribs and the spar webs. Sheet the *bottom* of the center section. If you're using angle hold-downs, install the bass or spruce hard points. If you're using rubber bands, omit this step. Sheet the top of the center section. Sand the leading edge to shape and sand the entire wing smooth before covering. If you're using rubber bands, set a 1/16-inch hardwood dowel into the trailing edge at a point where it will prevent the wing from being crushed by the pressure of the rubber bands.

- Lower wing. The lower wing is built in one piece over the plans.

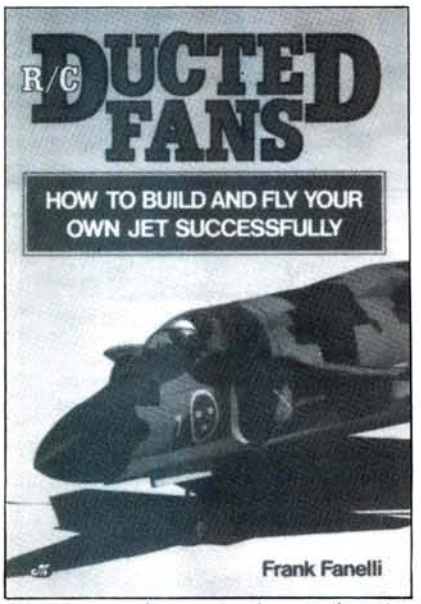
Pin down the lower spar and a 3/16-inch square strip 1/16 inch ahead of the rear spar. Use 1/16-inch scrap strips to block up the center R-4 ribs. Glue all except the two center R-4 ribs into place. Add the top spar, leading edge and rear spar. Install the wing tips. With a razor saw, saw completely through the top spar and almost completely through the leading

(Continued on page 62)

Jet Blast

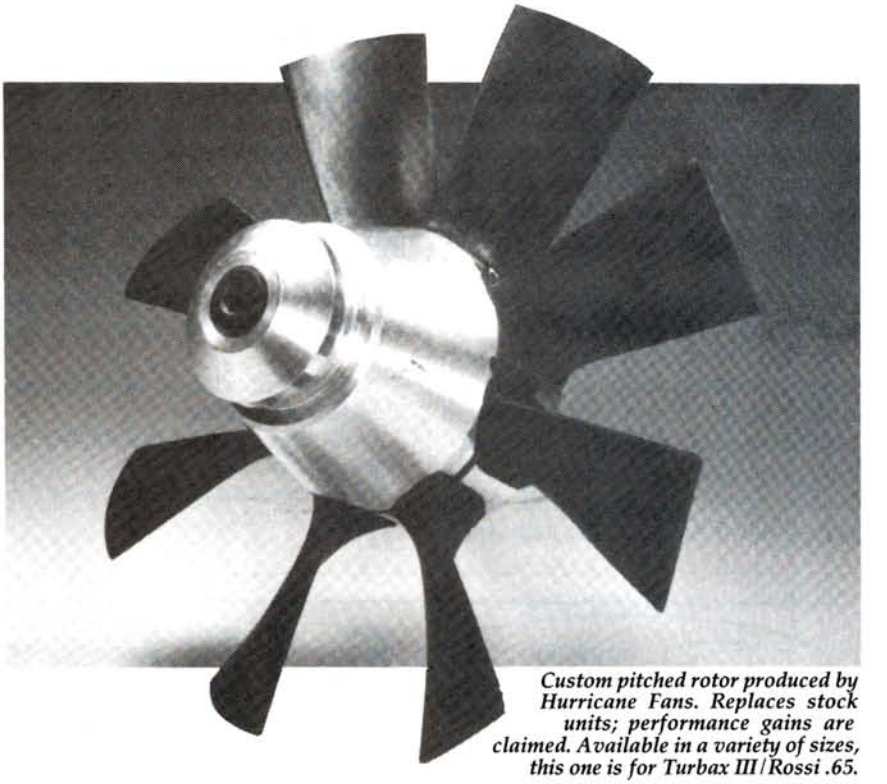
by RICH URAVITCH

A LOT OF YOU REGULAR readers have inquired about the availability of books or additional reading material addressing the subject of ducted fans. From a modeling standpoint, until now, the only book available was the excellent volume prepared a number of years ago by noted designer and aeromodeling innovator, Dick Sarpolus. It's published by Kalmbach* and is probably still available through them. Like many publications which talk about an emerging technology, some of the information is now dated (not unlike the first installments of this column which I started nearly five years ago). It's still interesting reading, but from a more historical, evolutionary perspective.



Brand-new soft-cover book on our favorite subject done by Frank Fanelli. Excellent work; very thorough and just technical enough.

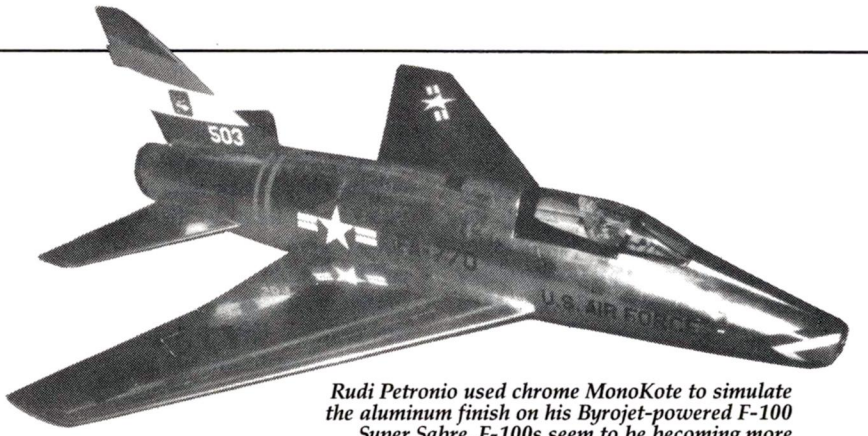
I've often thought about doing a book on fans, but always managed to sidestep the commitment required to actually sit down and get the job done. My old friend, and associate editor of *Flying Models* magazine, Frank Fanelli, has done what needed to be done; he has written an excellent book for all us FANatics. It's called: "R/C Ducted Fans—How to Build & Fly Your Own Jet Successfully." It's a paperback, and it's available through many book-supply houses or direct from Motorbooks International*. Frank has done a fine job in capturing what this fan stuff is all about, taking you from the early efforts through to the current state of the art. It's interesting and just technical enough to be completely understandable without being simplistic. As well as describing most of the available kits, fan units and engines currently available, Frank thoughtfully provides a list of ducted-fan material sources that includes names and addresses to enable the reader to obtain additional information.



Custom pitched rotor produced by Hurricane Fans. Replaces stock units; performance gains are claimed. Available in a variety of sizes, this one is for Turbax III/Rossi .65.

I received a nice letter from ace lens man, Dan Parsons. On a trip to the West Coast, he had the opportunity to see the Jet Hangar Hobbies* F-4 Phantom fly. The owner of JHH, Larry Wolfe, told Dan that the F-4 was exact scale, including airfoil sections and inlet openings. No cheater hole either. Larry's Turbax III fan unit is used, and it's driven by a Rossi .65. Although Dan didn't get on the sticks himself, he was impressed with the flying qualities, which included excellent vertical performance as evidenced by large, round loops. No firm word on kit-availability schedule, but you might want to contact JHH.

As I mentioned back in the May '87 issue, the F-4 has to be one of the most popular jet subjects around. It all started with Tom Cook's large twin, successfully flown to third place in last year's Scale Masters competition by Bob Fiorenze. We now see the move towards smaller, single-fan powered versions becoming available from Jet Hangar, Yellow Aircraft and Hobby Supplies Ltd.*, Nick Ziroli Models*, and Custom R/C Aircraft*. They're sized to accept everything from the 4-inch RK-20/RK-740 series right up to the Byrojet size. There's no



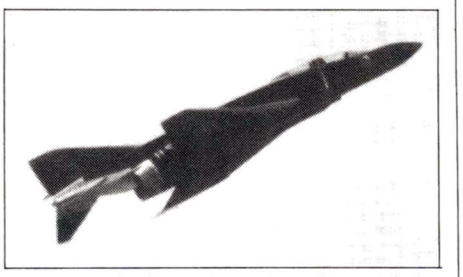
Rudi Petronio used chrome MonoKote to simulate the aluminum finish on his Byrojet-powered F-100 Super Sabre. F-100s seem to be becoming more popular. Cressline's version is just being released.

longer an excuse for not having a Phantom in your hangar.

I've mentioned this before, but I finally got my hands on an example which I'll be running shortly. Hurricane Fans*, in addition to producing their own fan units in various sizes, has the capability of producing rotors which are reportedly matched to specific engine/fan combinations. The rotor that I have will be used on my Turbax III which uses the Rossi .65. It appears to be extremely well made and has a machined spinner/blade retainer assembly. I'll let you know how it performs as soon as I've had a chance to test it.

While roaming through the aisles at the IMS show in Pasadena, CA, I spotted what appeared to be an aluminum overcast with the unmistakable shape of the F-100 Super Sabre. This one was being shown by Rudi Petronio*, who scratch-built his Hun from his own plug and molds. The design has been evolving for over a year now, and Rudi has it sorted out to the point that he's now prepared to kit it. It's designed for the larger-diameter fan units like the Byrojet or Hurricane, is 67 inches long and its 57-inch-span wing supports its reported 10- to 11-pound weight. It's available as either a semi-kit or a full kit; epoxy or polyester lay-up—your choice.

To allow you guys to coordinate your vacation plans with those of your wives or girlfriends, and so that you can include ducted-fan activities, here's a fan-event calendar for 1988. I've included every event I know about; if any of you hear of anything else, or are planning a fan event that you'd like the rest of us to know about, drop me a line.



JHH F-4 climbing out. Scale outline; airfoils and inlets are incorporated in kit. (Dan Parsons, photo.)

Larry Wolfe of Jet Hangar Hobbies prepping his new F-4 Phantom. Single engine with bifurcated tailpipe. Special twin-outlet tuned pipe custom fabricated by Mac's. (Dan Parsons, photo.)

- April 16, 17. HOTMAC Jet Rally '88, Waco, TX. Contact Mark Stephens, (817) 848-5047.
- May 21, 22. Third Annual Mid-Atlantic Fan-Fly, Virginia Beach, VA. (NAF Fentress) Contact Mike Ingalls, (804) 547-8500.
- May 21, 22. KCRC Fan Fly, Kansas City, MO. Contact Tom Cook, (816) 331-0356.
- June 4, 5. Bay of Quinte (Canada) Aeromodelers Fan Jet Rally, Belleville, Ontario. Contact Peter Sant, (613) 966-5160.
- July 9, 10. Third Annual Indy Jet Scramble '88, Indianapolis, IN. Contact Dave Bloomer, (317) 839-4449.
- September 10, 11. Island Classic Fan Fly, NAS Whidbey Island, WA. Contact Ronnie Kemp, (206) 845-8195.
- September 24, 25. Sixth Annual Greater Southwest Fan Fly, Ft. Worth, TX. Contact Dawn Buckley, (214) 263-3196 or Ed Couch, (817) 763-6094.

For peak performance, stay tuned...

**Here are the addresses of the companies mentioned in this article:*

Kalmbach Publishing Co., 1027 North 7th St., Milwaukee, WI 53233.

Motorbooks International, P.O. Box 2-Rev, 729 Prospect Ave., Osceola, WI 54020.

Jet Hangar Hobbies, 1230G Carson St., Hawaiian Gardens, CA 90716.

Yellow Aircraft & Hobby Supplies Ltd., Suite 201, 3040 Palston Rd., Mississauga, Ontario, Canada L4Y Z26.

Nick Ziroli Models, 29 Edgar Dr., Smithtown, NY 11187.

Custom R/C Aircraft, 249 Robin Way, Santa Rosa, CA 95407.

Hurricane Fans, 14835 Halcourt Ave., Norwalk, CA 90650.

Rudi Petronio, 11867 209th St., Lakewood, CA 90715. Phone: (213) 865-2052. ■

IF YOU FIND mistakes in this publication, please consider that they are put there for a reason. We publish something for everyone, and some people are always looking for mistakes!

BABY-BIPE

(Continued from page 59)

edge, rear spar and bottom spar. Make a couple of additional passes through the top spar to allow one wing tip to be blocked up ½ an inch. Butt-glue the spars and leading edge back together. Fit the 3/16-inch sheet dihedral brace between the top and bottom spars and glue it into place. Add the spar webs and the two center R-4 ribs. Remove the wing from the plan, turn it over and sheet the *top* of the center section. If you're using the angle hold-downs, install the bass or spruce hard points. If you're using rubber bands, omit this step. Sheet the bottom of the center section. Cut the ailerons from ¼x1-inch aileron stock. Sand the leading edge and the rear spar to shape, and sand the entire wing smooth before covering. Trial-fit the aileron linkages and the hinges before covering. If you're using rubber bands to attach the wing, you'll have to fit a filler block to the rear spar over the aileron linkages for the rubber bands to bear upon. A 1/16-inch hardwood dowel at the trailing edge would be a good idea as well.

• Fuselage. The fuselage isn't necessarily built over the plans, but it must be built on a flat surface to ensure trueness. A small machinist's square or a 90-degree triangle is necessary to install the formers at right angles to the fuselage sides and to correctly join the fuselage halves.

Glue the ⅛-inch square stringers to the fuselage sides. Add the 1/16-inch fuselage doublers and the ¼-inch gear block doublers. Glue the ⅛x⅜-inch spruce cabanes to the fuselage sides. Leave the cabanes just a little long at the top so that you can fit them to the wing exactly. If you're going to hold the wing on with rubber bands, now is a good time to match up the fuselage sides and drill the dowel holes. Glue F-1, F-2, F-4 and the cockpit floor to one fuselage side. Make sure that all are perpendicular to the fuselage side.

Glue on the other fuselage side. Make sure that both sides are square and parallel. Now is also your last good chance to install the blind-nuts for the motor mount on F-1.

Install the tank-compartment floor and the cowl blocks. Be sure to leave a space between the bottom cowl block and F-1 for an oil drain. The bottom cowl block should stand down at least 1/16 inch below the fuselage sides so that it will be even with the 1/16-inch plywood fuselage bottom when that is added.

Join the fuselage sides at the rear. Make sure that they come together on the fuselage center line. The tank floor and cockpit floor will keep the front half of the fuselage square while the rear is pulled together.

Install the ⅛-inch square cross and diagonal bracing. Install F-3, F-4A F-5, F-6 and F-7. Leave F-7 a little oversize, and sand it to shape after the top stringers are added. Add the top stringers. Start with the top and evenly space them. Sand down F-7 to match the stringers.

Make up the stabilizer fairing blocks from soft ½-inch balsa. Use two pieces of ⅛-inch scrap balsa to simulate the vertical and horizontal stabilizers. Tack-glue the blocks and the ⅛-inch scrap together, and then tack this to the fuselage with a couple of drops of CA. Carve and sand to shape, and then remove so that they can be covered separately and then installed permanently.

Install the ¼-inch plywood gear block and a small 3/16-inch or ¼-inch square

(Continued on page 68)

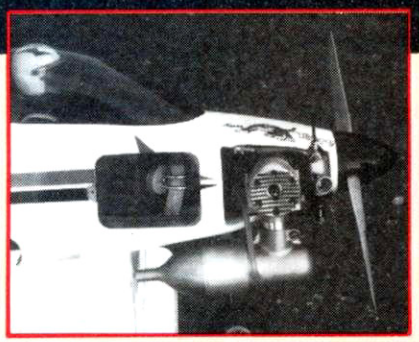
Model Type: *Sport pattern with fixed landing gear.*
Wingspan: *62½ inches*
Weight: *6 pounds, 2 ounces completed*
Wing Area: *609 square inches*
Wing Loading: *22 ounces/square feet*
Power: *Super Tigre Bull Ring 46*
Prop: *11-5*
Number of Channels Required: *4*
Features: *90 percent pre-built balsa aircraft; fixed gear; blue tinted canopy*

GREAT PLANES

SCORPIO FIESTA 45

...With all the woodwork done, you just final-assemble, finish and fly!!

by CHARLIE KENNEY



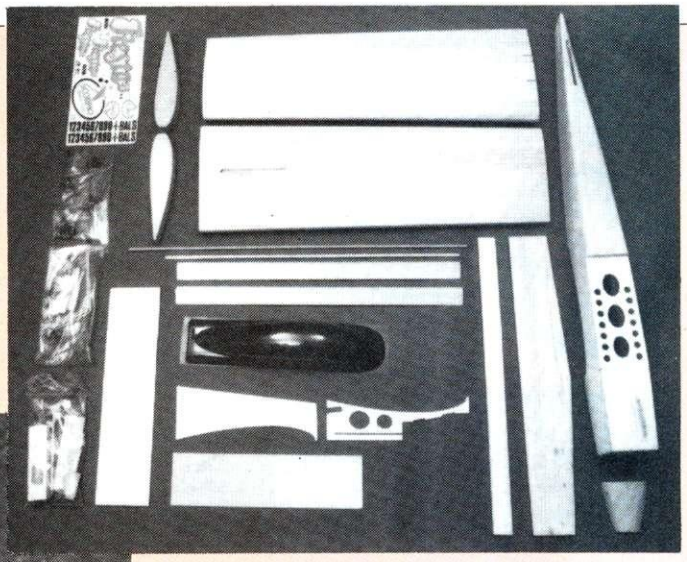
Above: *The completed Scorpio shows off its angular but clean lines.*
Right: *The business end has convenient hatch for fuel-tank access.*

THE SCORPIO FIESTA is an all-balsa ARF made by Scorpio of Trenta, Italy, and it's one of eight Scorpio ARF balsa kits imported by Tower Hobbies*.

The model comes with completely built-up wings made of all-balsa sheeting over balsa ribs. The fuselage is also jig-built and has plywood sides, bulk heads and doublers inside the radio compartment. The doublers are die-cut and separate easily, as do the other plywood parts. The tail feathers are solid ¼-inch balsa, which

has been pre-cut to size, and both the wing and stabilizer leading edges are pre-shaped and need very little sanding.

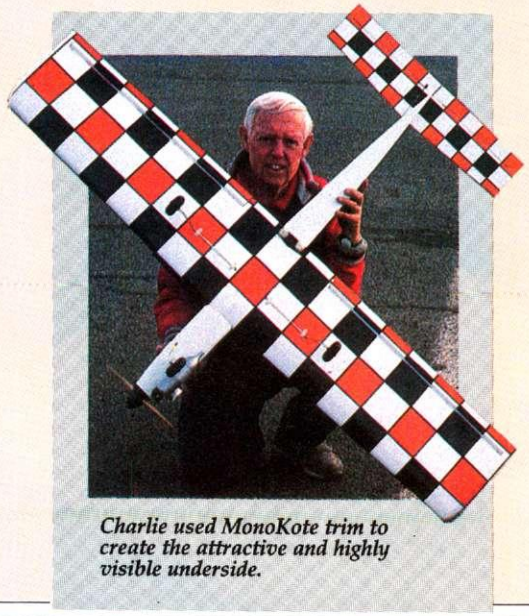
ASSEMBLY: Join the wings with the die-cut dihedral braces provided, and saw and carve the wing tips. The fuselage is routed with slots to accept the stab and vertical fins. The kit also includes die-cut plywood servo trays for the fuselage (3 servos) and an aileron servo. The nose is assembled from balsa pieces and



Above: *The kit comes out of the box this way; perfect for the modeler with limited building time.*
Left: *Williams Bros. pilot and some instruments dress up the cockpit area.*

should be epoxied in place. Building took about 12 hours.

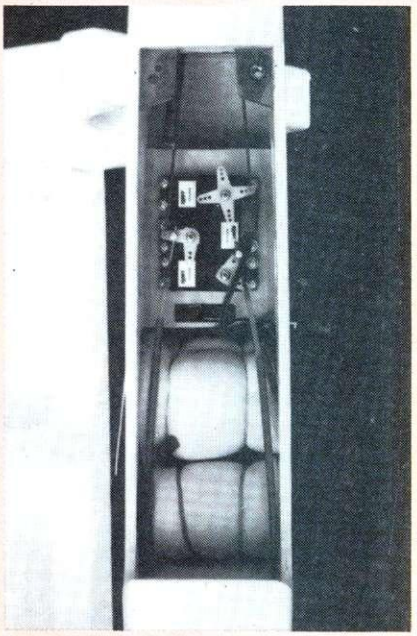
If you build a Scorpio, try Pro Mesh self-adhesive fiberglass mesh on the wing dihedral joint. Available at your local paint store, it's usually used for sealing the joints between wallboard before spackling. I used 3-inch-wide Pro Mesh to reinforce the joint, by first wrapping the wing at the center section, then painting two coats of epoxy over it. This saved a lot of sanding time, and there were no messy frayed ends. I used Hot Stuff* throughout the assembly.



Charlie used MonoKote trim to create the attractive and highly visible underside.

The double-sided, full-size plans are excellent, and the pre-cut parts fit the drawings well. There are also 25, 2½x3½-inch isometric drawings showing the various construction stages.

The wings, stab and vertical fins were covered with white Super MonoKote, and MonoKote trim was used for the orange and black squares on the underside of the stab and wing. The fuselage was painted, because the canopy forms an integral part of the fuselage, and it would have been difficult to MonoKote due to the canopy fit and trimming. The fuselage was first covered with silkspan and then given three coats of clear butyrate dope which was lightly sanded. Next, I sprayed it with Cheveron* Perfect Model paint primer. After wet-sanding the fuselage, I gave it three coats of white Cheveron paint, wet-sanding between the second and third coats. This resulted in a mirror-finish fuselage. Give Cheveron a try. I've been using it for the last five years, and it matches the MonoKote colors perfectly. It's available in both spray and brush versions. A complete set of decals is provided in the kit. I used many of them, as you can see in the photos.



Radio room is adequate for most systems. Tidy, efficient installation.

To complete the Scorpio, I had to buy a spinner, wheels, gas

(Continued on page 118)

BABY-BIPE

(Continued from page 62)

bumper-block to the back of the firewall (F-1). This will keep the battery from shifting forward and pinching off the fuel tank overflow line. This is also your *last* chance to install the motor-mount blind-nuts if you haven't already done so.

Glue the 1/16-inch plywood sheeting to the bottom of the front of the fuselage. Use a couple of pieces of scrap 1/16-inch balsa to blend the plywood with the cowl.

Drill the four mounting-screw holes in the gear blank, and then use the gear as a template to drill the fuselage for the landing-gear mounting-screws. Be sure to bend the gear legs so that there's approximately 3½ inches between the fuselage bottom and the center line of the axles.

The fuselage top sheeting is cut from 1/16-inch balsa. The template is slightly oversize to allow for a final fitting. Soak the balsa with household ammonia and wrap it around any 2¼-inch- to 2½-inch-diameter round object. (I used a cardboard tube.) Cover the balsa with waxed paper or plastic wrap and then with a layer of stiff paper and wrap it with tape. Let it dry completely, at least overnight. *Do not* install it onto the fuselage at this time. You could make the top sheeting from 1/64-inch plywood and not bother with the ammonia, etc., but, on average, the 1/64-inch plywood weighs twice as much as balsa.

While the top sheeting is drying, and before we complete the fuselage, we can work on the wing mountings, servo mounts, fuel-tank installation and the throttle linkage. Before going any further, make up the wing mounts.

• Wing mounting. If you're using rubber bands to attach the wing, all that needs to be done is to cut the two 1/8-inch hardwood dowels to the proper length for the fuselage (don't install these permanently until after covering) and glue the optional wing saddles to the cabanes at the proper incidence angle. If you're using the angle hold-down brackets, proceed as follows:

• Lower wing. Carefully sand the wing saddles in the fuselage until they exactly match the wing. Make sure that the wing incidence is 0 degrees and that the wing is perpendicular to the vertical center line of the fuselage. Also, make sure that the wing tips are equidistant from the center of the rear of the fuselage.

Make up the four 3/16x½-inch bass blocks, the two 3/16-inch balsa filler blocks and the two 3/16-inch square balsa pieces as on the plans. Glue the bass blocks to the balsa pieces as shown on the plans, but don't glue them to the fuselage sides.

Before gluing these block assemblies to the fuselage sides, install the shoulder screws for the angle brackets so that the angle bracket is *exactly* flush with the lower edge.

Glue the anchor-block assemblies to the fuselage sides. Keep the bottom of the blocks exactly flush with the edge of the wing saddles.

Slip an angle bracket on each of the shoulder screws. Make sure that they all release when the wing is pushed to the rear. Position the wing carefully, as shown in Step 1. Mark the position of the retaining screws on the wing, using the brackets themselves as templates. You'll have to do this through the open top of the fuselage.

Remove the angle brackets from the fuselage and install them on the wing.

IMPORTANT! Before trying to pop the wing into place on the fuselage,

(Continued on page 70)

BABY-BIPE

(Continued from page 68)

slightly open the engagement hooks of the angle brackets. If you don't, they'll engage so firmly that the wing will be very difficult to remove again. This is a matter of cut and try, and it's best to get this correct now, before the fuselage top is closed, in case you have to pry an angle bracket off of a shoulder screw. Obviously, you don't want the wing to fall off, but you have to be able to remove it when you want. The wing should pop into place easily and require a firm steady pressure of the thumbs on the leading edge on either side of the fuselage to release it.

- Upper wing. Glue short doubler pieces of ⅛x⅜-inch spruce to the top of the cabanes. This gives the necessary width for the angle-bracket mounting screws.

Carefully sand the cabanes to a perfect fit on the top wing. Check the incidence and alignment of the wing as in Step 1 for the lower wing.

Attach the angle brackets to the cabanes as shown on the plans. Reposition the wing and mark the location of the shoulder screws using the brackets themselves as templates. Drill the wing and install the shoulder screws. After trial assembly and balancing, remove the screws while you're doing the covering.

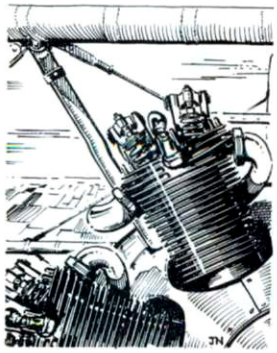
In effect, the top wing will be permanently mounted to the fuselage. If you want to remove it, you can use a flat stick or a screwdriver to remove the angle brackets one at a time. Because the Baby Bipe is small, you'll seldom remove the top wing.

- Fuselage (continued). Now is a good time to install the servo mounts and servos, as the fuselage is still open top and bottom. Mount everything as far forward as possible. Make up your pushrods. I made mine from ⅛-inch square spruce with .045-inch music-wire ends. I used a "Z" bend at the servo and a Sullivan* Pylon brand 2-56 threaded copper coupler soldered to the clevis end. I cut off the threaded portion and only used it to keep the weight at the tail to a minimum.

Route the throttle linkage. It will have to run along the side of the tank compartment. Leave room for the tank itself.

Fuelproof the fuel tank compartment,

(Continued on page 74)



Four-Cycle Forum

by CHRIS ABATE

KEEP THE PROP TURNIN'

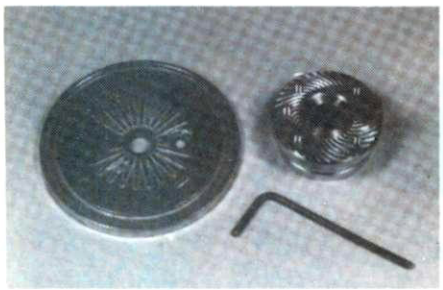
SPITTING WAS ONCE acceptable. Men were even judged according to how accurately they spat! Now, however, spitting in public is as unacceptable to us as is our engine's "spitting" props in flight. "Spitting a prop" is the term we use when our propeller decides that it's time to leave its mooring and fly off the engine shaft. This has at least three major results: First, once the prop nut and prop come off, so does the $5 to $25 spinner. Second, your flight, for which you've just waited at least 30 minutes, is over. Third, all eyes will be watching as you go for your dead-stick landing! You can almost hear the satisfied whispers of, "He'll never make it!"

I've heard a lot about the problems people have trying to keep their props on their engines, especially on 4-strokers. Here are a few methods to cure this problem:

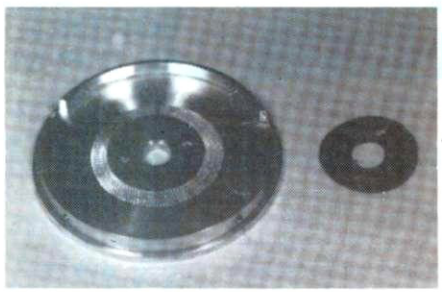
One major contributor to the loosening of the prop is detonation, and the biggest contributor to this is tweaking the needle valve. *Don't do it!* If you need more rpm or power, try a larger engine or change your prop's pitch. When setting the needle on a 4-stroke, go slowly. If you go too far lean, you'll hear the engine start to pop, signaling the onset of detonation. This causes the prop to try to stop and then start again almost immediately, time and time again, until it finally loosens and comes off. While you're setting the needle, if you go too lean and hear the detonation, richen it up a half to three-quarters of a turn counterclockwise. Not only are you likely to save a prop and spinner, but you'll also save wear and tear on your engine. I know of flyers who do this to set their engines before flights, and they swear by this approach.

The one sure-fire way to set the needle valve is with the use of a good tachometer. Again, slowly turn the needle valve toward lean, while watching the needle on the tach. Because hearing varies, you may or may not hear the detonation, so let the indicator on the tach be your "ears." When the meter stops climbing and starts to decrease, note the reading. Richen the engine, and start to lean again, coming to within 100rpm to 200rpm of the noted drop-off reading. I do this, and find that it produces very consistent and reliable results.

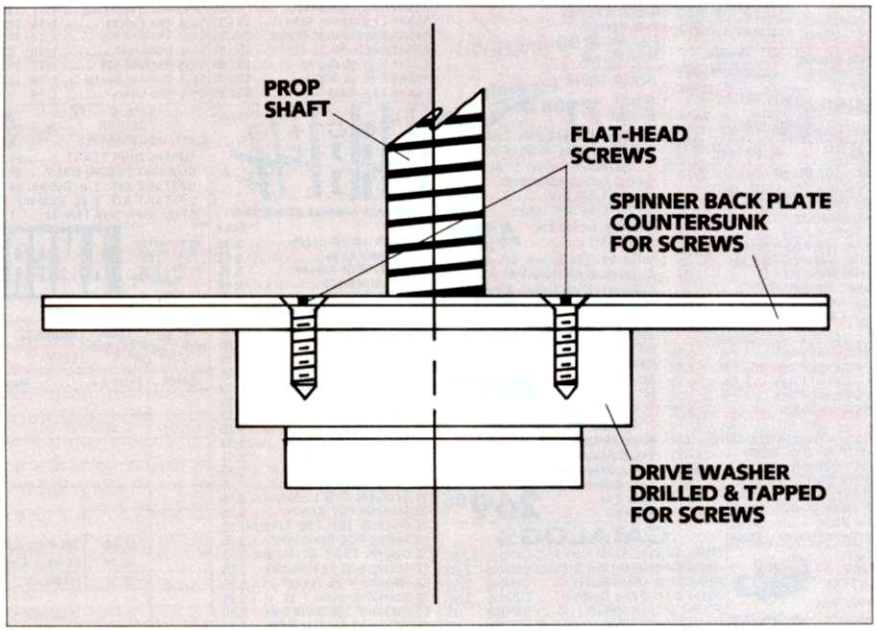
Another method of prop retention is to use leather discs cut to the same outside diameter as the drive washer and with inside diameters to match the prop shaft. Two discs are used, one between the drive washer and the spinner back plate, the other between the prop and the back plate. To make these, use leather that is approximately 1/16-inch thick. One square foot of leather will keep you in good shape for a long time. If you prefer, sandpaper can be used as an alternative to leather; an 80-grit paper works well. If you use sandpaper, you'll need to cut four

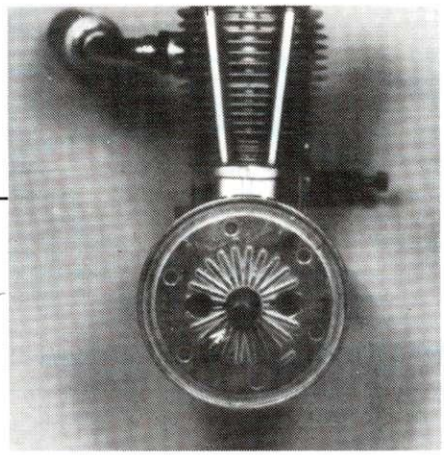


Thrust-washer on right drilled and tapped to accept flat-head Allen screws. Spinner backplate drilled similarly and countersunk to accept screws.



Leather discs used with Saito 2.70 Twin. Discs supplied with engine.





4-40 flat-head screws secure spinner backplate to thrust washer. Screws located at 3 o'clock and 9 o'clock postions.

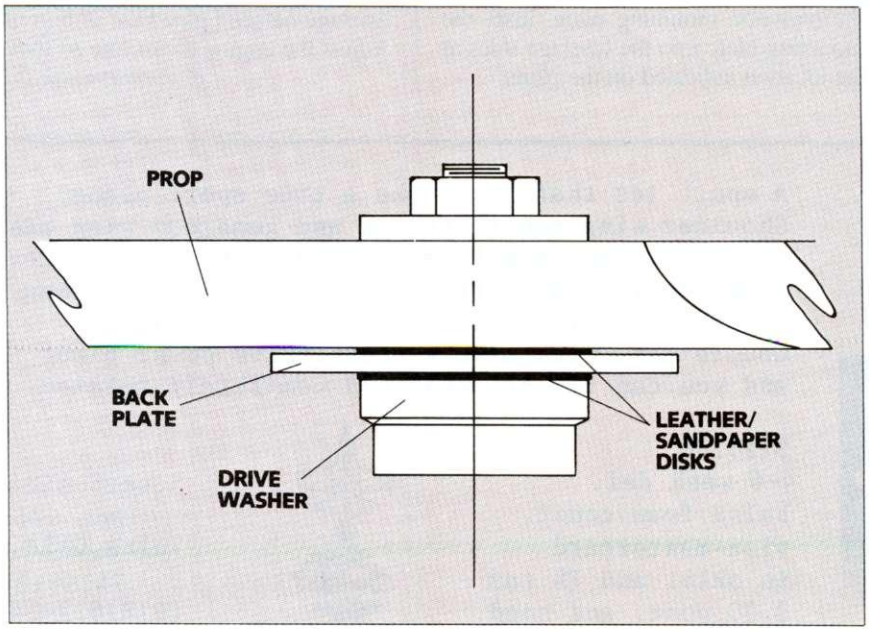
discs. Glue them together in pairs, smooth side to smooth side, and you'll have two sets. Position these in the same locations as previously described for leather discs. Remember that we're trying to prevent slippage by increasing friction, and leather or sandpaper discs seem to do just that.

Yet another method of securing your prop is to pin the spinner back plate to the drive washer. Use two socket-head screws for this. The screws should be flat-head, the back plate should be countersunk to match the screw heads, and the drive washer should be drilled and tapped to match the threads. Flat-head screws are preferred, as they keep the face of the spinner back plate smooth, with no protrusions.

To ensure a flat surface for the prop to seat against, take care when drilling the back plate and the washer. This should be done off the engine, keeping in mind that the holes for the prop shaft in the drive washer and back plate must stay in alignment. Using a nut and bolt, or a metal dowel rod of the same diameter as the prop shaft, will ensure alignment.

A drill press is also extremely helpful. Drilling the prop, and using bolts or metal pins which go through them and match up with holes in the drive washer, is another way of securing it. I don't recommend this, because I've seen one of my props come off in halves, because it had fatigued at one of the holes drilled in it. The use of a proper wrench (box or open-end) to tighten down a prop nut is essential. Forget the pliers!! A crescent isn't recommended either.

Remember, don't go for max rpm. Check the prop nut after each flight during your regular post-flight inspection. While you're at it, check the wing hold-down screws, the spinner screw and the wheels, and thoroughly inspect the air frame. You can never be too cautious in protecting your plane from disaster!



BABY-BIPE

(Continued from page 70)

and install the fuel tank. Wrap the tank in thin foam, attach a 12-inch to 14-inch length of fuel tubing to the overflow and run it down through a 3/16-inch hole drilled through the tank compartment floor and the fuselage bottom sheeting. Bring it back up and through the firewall, and attach it to the tank outlet.

Put the tank into the compartment and pull out the excess tubing, cutting it off at the correct lengths for the overflow and needle-valve connection. Make sure that the tank-clunk and throttle-linkage are working properly. After the top sheeting is installed, you'll have to cut the fuselage open to get to them.

Install the top sheeting. Carefully trim the top sheet to a perfect fit now that it has dried to the approximate curvature of the fuselage formers. Add some scrap 1/16-inch or 3/32-inch square strips to the top of the fuselage doublers. These will provide a backing and a good gluing surface on which to attach the top sheeting. Sand the cheek cowl edges round and smooth along the entire fuselage before covering.

The fuselage is now complete, except for the tailwheel or the tailskid. Before making a final choice, assemble the Baby Bipe and check the CG. Actually, I covered the tail surfaces, the stabilizer fairing blocks and the top rear of the fuselage, and I also installed the pushrods and the control horns before I checked the balance point. These items don't weigh very much, but it doesn't take much to move the CG quite a lot.

If you can stand a little extra weight at the tail and you want a tailwheel, all that's required is about a 1-inch length of 1/16-inch plywood inset into the rear of the fuselage with a slot in it for the tailwheel bracket. I narrowed my bracket to match the taper of the fuselage and, after covering the fuselage, I glued it into place with CA (no screws). Be sure to bend the tailwheel wire so that the tiller goes between the control-horn pieces.

If you're using a tailskid, bend up the .050-inch music-wire skid and sew it to the plywood mounting plate. Inset the mounting plate into the fuselage sides at the location indicated on the plans.

Cover the Baby Bipe in a highly visible color scheme, as orientation can be a problem with small biplanes. Cover the pieces separately before assembling, i.e., the tail surfaces, fairing blocks, ailerons, etc. It's still hard to beat MonoKote*. Paint the engine compartment and the cabanes with HobbyPoxy* or other fuel-proof paint.

All that's left now are the little details: the switch-harness installation, the aileron servo mounting, the engine mounting and the final assembly.

Some final comments before you test-fly. When you establish your thrust and incidences, start with the lower wing and get it as close to zero degrees as possible. Then set the top wing so that it is zero degrees or slightly negative relative to the lower wing. You absolutely don't want any positive incidence in the top wing. Set the horizontal stabilizer so that it will be slightly positive to the lower wing. I did this by sanding just a bit off the rear of the fuselage before I glued the stab in place. Adjust the engine thrust-line so that you

(Continued on page 76)

BABY-BIPE

(Continued from page 74)

start close to 0 degrees/0 degrees, but with just enough right- and down-thrust to be sure that you don't have any left-or up-thrust.

The control throws: the throws shown on the plans call for a 1 foot, 4 inch up and down aileron, a ½-inch up and down elevator. (Mine actually had a 9/16-inch down elevator.) A ¾-inch right and left rudder provide good, crisp, aerobatic flight without being too sensitive. If you've never flown a really responsive model before, you might want to reduce these throws by 25 percent. Obviously, make sure that all surfaces are centered at neutral before attempting to fly for the first time. And, finally, the center of gravity; if possible, try to start out about ¼ inch ahead of the CG shown on the plans. I wouldn't fly for the first time with the CG aft of the point shown on the plans.

That's it. You're ready to really impress people with what a *good* small airplane can do.

**Here are the addresses of the companies mentioned in this article:*

Fox Manufacturing Co., 5305 Towson Ave., Fort Smith, AR 72901.

Sullivan Products, 1 North Haven, Baltimore, MD 21224.

MonoKote is distributed by Top Flite Models, 2635 S. Washash Ave., Chicago, IL 60616.

HobbyPoxy Products, 20 Pine St., Rockaway, NJ 07866.

QUIET FLIGHT

(Continued from page 42)

come in. Brian and his flying buddies were dissatisfied with the available slopers, as they quite often broke when trying to hit the landing area. So Brian and company designed a series of PSS models specifically for their flying site. They came up with a Spitfire, a P-39 Airacobra and an ME-109. The models feature 46-inch span foam-core wings sheeted with 1/64-inch plywood, fiberglass fuselages of exceptional strength and sturdy, sheet, tail surfaces.

The wind was rather light on the day I saw the ME-109 fly. With its semi-symmetrical airfoil it performed quite well on aileron and elevator at a flying weight of 28 ounces. The model was relatively fast, very smooth and quite aerobatic despite the light wind conditions. It flew inverted and did very quick, clean, axial rolls. Brian says that his next design will be a P-51 Mustang. The bad news is that, at this time, Brian only sells partial kits, and only at the Bluff Cove site. Sorry! If you have an interesting model that you'd like to see featured as the "Model Of The Month," send me a couple of good black-and-white photos along with a description of it. Your model may end up in a column.

Astro Flight Electric Championships

The Astro Championships are scheduled for June this year in Southern California. The power events will take place at Sepulveda Basin on Saturday, June 11. The old-timer and sailplane events will take place at the Harbor Soaring Society's field in Costa Mesa on Saturday and Sunday, June 18 and 19. It appears that I'll CD, or at least co-CD, the old-timer and sailplane events. There will be four classes: 7-Cell and 6-Cell Unlimited Old-Timer, and 7-Cell and 6-Cell Unlimited Sailplane. Trophies will be awarded to the top three in each class, with lots of good prizes. If you've ever been to the contest in the past, you know what I mean. The format will be different from that of previous years, with varied motor

(Continued on page 79)

QUIET FLIGHT

(Continued from page 76)

runs and flight times, in/out landings for old-timers, spot landings for gliders and a minimum of four rounds. If you're in Southern California during June, try to attend the longest-running electric contest in the US.

●*Here are the addresses of the companies mentioned in this article:*

Sun Fair Aircraft Designs, Carlsbad, CA 92008.

Airtronics, 11 Autry Lane, Irvine, CA 92718.

Sig Manufacturing Co., Inc., 401 S. Front St., Montezuma, IA 50171.

Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.

Carl Goldberg Models, 4734 West Chicago Ave., Chicago, IL 60651.

Combat Models, 2128 48th Ct., San Bernadino, CA 92407.

Flight Concepts, 1211 Parkinson Ave., Palo Alto, CA 94301.

Eldon J. Lind Co., 3151 Caravelle Dr., Lake Havasu City, AZ 86403.

American Sailplane Designs, 2626 Coronado Ave. #89, San Diego, CA 92154.

PAUL MANTZ

(Continued from page 47)

flyer—a term he preferred to "stunt pilot"—and was much closer to being a test pilot like Chuck Yeager, with whom he worked.

Even those who aren't intimately acquainted with Mantz's career have almost certainly seen his work in the more than 250 films he made over 40 years. He was the guy who flew that Stearman through the wide-open hangar while everyone scrambled for cover; it was he who miraculously pulled the spiralling—apparently doomed—plane out of a death spin at the last possible second. From "Air Mail" to "Twelve O'Clock High" to "Cinerama," Mantz was aloft, at the controls, doing something new and daring.

He took us along the Grand Canyon in autumn, right down on the deck over the veldt in Africa, and inside a volcano. If it could fly, he flew it! There's a story that he was even ready to take up a barn door if it had an adequate power source attached to its edge!

To anyone who is even remotely interested in airplanes and flying, the prospect of seeing this film is dazzling indeed. Mantz's career spans a flamboyant era in which the most famous and heroic figures in aviation history were flying—Jimmy Doolittle, "Slim" Lindberg, Amelia Earhart, and great stunt pilots like Frank

(Continued on page 96)

Giant Steps

by DICK PHILLIPS

This article continues last month's discussion of scale design.

PREVIOUS DISCUSSION focused on the preparations necessary to design a plan for a large-scale model aircraft. The information doesn't *only* apply to scale models. You can take a plan for an old-timer, a sport model, or anything you like, and make a large-scale plan from it.

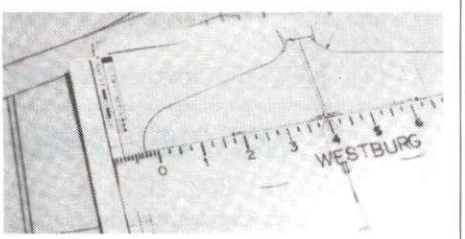
I also described a variety of methods to enlarge existing plans to a desired scale. This month, I describe working from a set of good three-views and making a plan to a particular scale. You need a really *accurate* set of three-views. If they aren't accurate, the resulting plan will also be inaccurate and, on a larger scale, these errors will be even more evident. If you're enlarging an old-timer or a purely sport model, this problem may be ignored.

With the drawing surface prepared (Mylar, remember?), we can begin. There's no point in drawing a good plan if it can't be reproduced easily and inexpensively, and Mylar will permit such reproduction.

Working from the Peter Westburg drawings is a real pleasure, as Peter supplies many measurements which were taken from the original airplane. However, even with only a few dimensions given, it isn't difficult to make your own scale ruler for the plan being worked on. For example, some of the ATC drawings mentioned last month give only the wingspan, fuselage length, tail-group span and so on, so measurements are minimum. This is easy to get around, so let's make a scale ruler for the Westburg Coupe.

It's easiest to work with a dimension that comes out evenly. The Monocoupe had a wingspan of 32 feet, so we'll use that here. It's a good idea to use a strip of transparent or translucent material for this ruler. A *tinted* ruler is better, as a totally clear piece of plastic seems to have the knack of disappearing as soon as you put it down!

Refer to Fig. 1, and draw a line, A-B, on the material from which the rule is to be made. Next, draw a second line, A-C, at any shallow angle to line A-B. Then, on line A-B, measure the scale distance of the area of the three-view being used. In the case of the Monocoupe, we don't actually need a rule equal to the wingspan, so we'll use a half span, or 16 feet at the scale of the Westburg plan. That comes out at 1.6 feet (32-foot span at 1/10 scale = 3.2 feet. Half span equals 16 feet at full scale, or 1.6 feet at 1/10 scale.) Therefore, our scale ruler will be 1.6 feet (19.2 inches) long. Now, on line A-C, measure off 16 equal spaces of any convenient length. I used 1-inch spaces in my example. Join the last of these 16 points on line A-C to the point B, which is 19.2 inches from A. (An engineering scale calibrated in tenths of an inch will be useful for this and also for marking any measurements arrived at through the use of a calculator.)



Here's the reason Dick recommends the use of a* tinted *scale ruler. Much easier to see when measuring or transferring dimensions.

After joining the last point on line C with point B, keep the triangle used for line C-B parallel to line C-B, and mark all the other points on line A-B to coincide with the points on line A-C. Each of these marks represents 1 foot. As is customary with scale rules, draw an additional line, 1 scale foot in length, at one end of the scale (A-D in our example), and then divide it into inches in order to have a fine measure for the smaller distances. (e.g., One half division equals 6 inches, one quarter division equals 3 inches and so on. In my example, the smallest division is 1½ inches—not too convenient, but usable.) In this way, we make a rule which allows us to measure "real" distances off the scale three-view in the original measure. These may then be translated into the correct scale measurement for our plan.

On our scale ruler, each foot equals 1.208 inches. This isn't a particularly handy measurement, so the choice of a distance to use as the basis for the scale ruler is important. A convenient distance will provide a scale ruler that is very convenient for our purpose. Remember, this ruler is for use with this three-view (or any other one which uses 1/10 scale), and it will be of no use with a three-view at any other scale.

When drawing the new plan, begin with the simpler assemblies. This will give you a "feel" for plans work, without getting you into a situation where, if you make an error, you'll have a lot of work to do to correct (or re-draw) the assembly. The tail members are a good place to start, so let's begin with the stab and elevator.

Draw a line on your drawing equal in length to the finished span of the stab/elevator of the model to be built. Draw another line perpendicular to the center of that line. These two lines represent the rear edge of the stab and the center line of the assembly. The hinge line on your original is already in place; if there isn't a center line on your three-view, draw one. These lines will be our reference points for the drawing of the stab/elevator assembly.

Using the prepared scale ruler, on the three-view, measure the distance from the hinge line to the front of the stab, and mark the scale distance on the center line of the drawing. If the rib locations are shown on your three-view, scale them to your drawing at the appropriate scale locations. If they aren't shown, you might be able to position them by using other material in your documentation. If not, on the three-view draw several lines parallel to the center line and evenly spaced between the center line and the tip of the stab. Scale the measurement of these lines (between the hinge line and the leading

edge) onto your drawing, then measure the distance from the hinge line to the leading edge, and scale these distances to the drawing.

Using the scale rule prepared for this plan, measure the distance required; this will be a full-scale measurement. Using a calculator, divide this measurement by the proper factor to arrive at the finished size for the plan. For example, if the distance from the hinge line to the most forward point on the stab is 37.5 inches, then that same distance on our plan must be 12.5 inches to be correct for a 1/3-scale model.

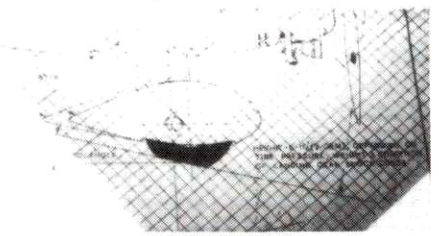
This done, you'll have a series of points which represent the outline of the leading edge of the stab. It's then a relatively simple matter to connect the dots and so draw the line of the leading edge. In some cases, the radii of the curves and of the center are shown; these measurements may be used to draw the curves on the scale drawing. If they aren't shown, or are irregular curves, they must be drawn with the help of a French curve. To use the French curve, you need a good eye for shape. Alternatively, a square grid may be prepared, and the curved shape transferred using the grid method.

The grid method enables you to enlarge an irregular shape. I've made a grid on clear, tinted plastic which I use for this purpose. It's much easier to lay the grid down over the part to be enlarged than it is to draw a grid every time I need one. Of course, the grid on the finished drawing must be drawn, but for smaller shapes this isn't a problem. On the Westburg drawing, the wheel pant (a highly irregular shape) was enlarged to the appropriate size using the grid method. My clear plastic grid has 1/4-inch squares, so to enlarge the three-view to 1/3-scale, the squares must be of a size that will provide this enlargement. A calculator tells us that this requires .83-inch squares to provide the correct scale (actually .8325, but that's getting hard to take off a scale measured in tenths!). This isn't absolutely accurate, so no large assemblies should be enlarged using this method. In addition, your ability—or lack of ability—to measure a mark as fine as .83 inches off an engineering rule will also have an effect. Care is required, and use this method sparingly, as it has a built-in "fudge factor." Alternatively, the smaller squares on the grid could be made up to provide an accurate (and easier to measure) grid scale. As my grid was already made, I used it.

After the stab has been outlined, complete the elevator using the same method. The Westburg drawing shows the scale rib locations, and I use these to provide the rib locations on the finished drawing. Be sure to allow for the hinge space between the stab and elevator so that everything remains in scale.

When the outlines of the stab and elevator have been established, the details may be added. If the leading edge is sheeted, the outline of the sheeting should be transferred to the drawing. The locations of any bracing wire, strut hardpoints, markings, or any other details may be transferred using the scale ruler.

Now that we have the stab/elevator assembly planned out, we can move on to the details which we'll use in construction.



Scaling "grid" makes transferring dimensions much easier and creates multiple reference points.

For example, will the tail group be made up from sheet stock and, if it is, will strips of wood be added to simulate the ribs? Or will the tail feathers be made from cut ribs with internal spars? These are details which need to be decided now and drawn to scale on the plan sheets (especially if rib and spar construction is to be used). In the case of the Monocoupe, the stab/elevator is a very thin airfoil shape, and the easiest way to approximate this is by using sheet stock as a base and adding thin strips of material to simulate the ribs.

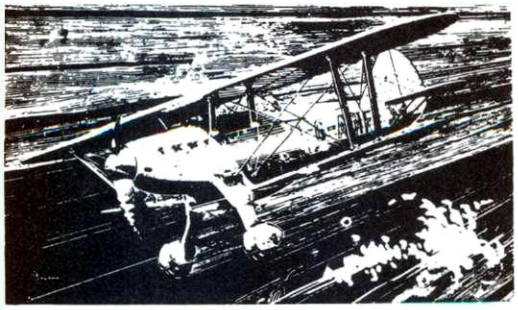
Be sure to complete the drawing of the stab/elevator before moving on to other assemblies. Add any necessary details, and then add the construction notes (if any) to ensure that you've completely finished this area of the drawing. If you don't complete it now, there's a good chance that you'll forget to go back to it, and the plan will then lack some details necessary for construction. The stab/elevator assembly is only a small part of the drawing and probably wouldn't suffer much if some details were forgotten. However, if you get into the habit of fully completing each section before moving on, there's less likelihood that details will be forgotten anywhere on the plan.

The fin and rudder should be next on your schedule. Using the same method as you used with the stab/elevator, lay out the base lines for drawing them. The hinge line may again be used as the main base line, and the base of the fin may be used as the other reference point. If this isn't convenient because of the construction of the fin and rudder, draw a line perpendicular to the hinge line, and let it represent the upper limits of the fin and rudder. It doesn't matter where the intersection of the two reference lines occurs on the three-view, but it *is* important to establish a point from which to work.

Next, using the scale ruler, measure the appropriate distances as you did before, and then calculate them to the proper scale and transfer them to the drawing.

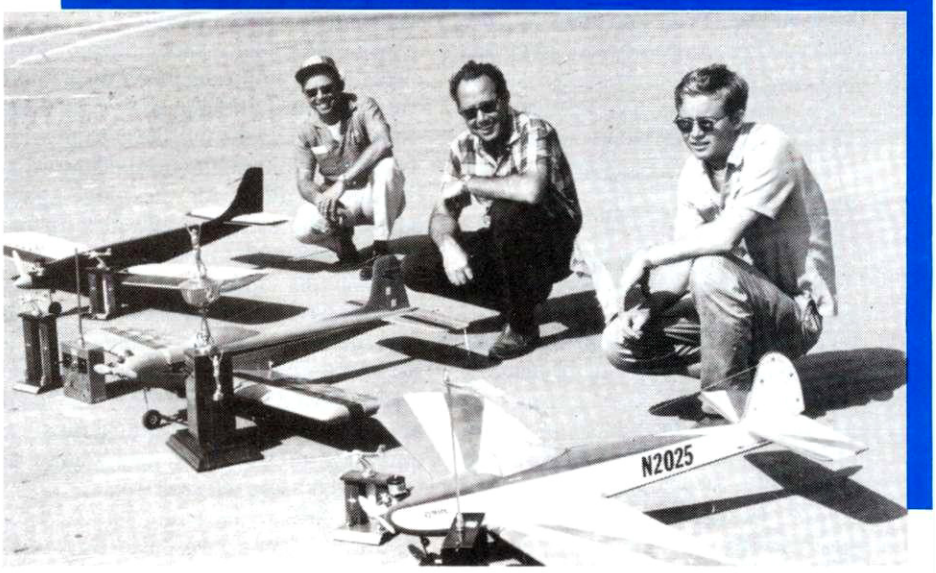
The Westburg drawings provide both de-skinned and skinned views of the airplane, and these are very useful, as they show both the interior details and the appearance of those details from outside. While you won't always have such complete information, if you've done your homework properly, have gathered all the details you can find and still aren't able to decide on a particular detail, just follow your instincts (or best guess) and forge ahead. If you've searched diligently and haven't been able to find the information you want, there's little likelihood that anyone else has been able to find it either, so you're unlikely to be challenged.

Next month, we'll get to the wings and fuselage on our plan design. The wing is more of the same thing that we did to establish the tail group. The fuselage is where the real work comes in and where many lose their enthusiasm. I'll try to make that part of the job as easy as possible for you. See you then?



Golden Age of

by HAL "PAPPY" DeBOLT



The 1965 NATS winners. (l to r) Cliff Wierick, 2nd; Phil Kraft, 1st; Jerry Nelson, 3rd. All used proportional systems.

PERHAPS WE SHOULD begin on a somber note, for reasons raised in many letters from outstanding OTers. When a nationally known modeler passes on, we read about it with sorrow. R/C has also progressed rapidly because of the guidance and help provided at the *local level* by many dedicated, unsung OT R/Cers. When we lose one of these, it also hurts.

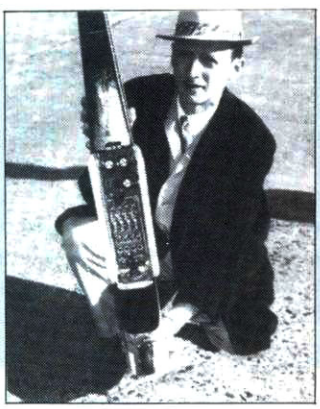
A letter from John Strobel tells of his pop, an R/C guiding light, and says it best. E.N. "Jack" Strobel began R/C with an early single channel, progressed through reeds, early proportional and so on to the present day. Along the way, he brought his son and even his grandsons into our sport. Well known locally, he was always there to help others. The "clan" adopted the nickname "the Wrong Brothers" after some common stupid mistakes such as launching an OT Buzzard Bomb Shell with the receiver turned off. (Sound familiar?)

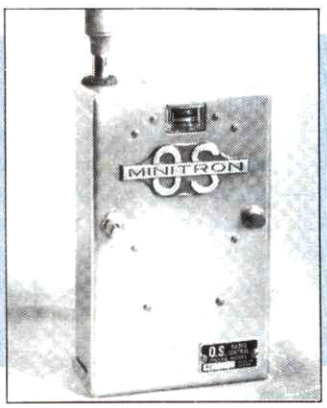
At age 79, Jack's last flights were made from a wheelchair, flying an OT Quaker powered with an OS .60 4S. Jack never threw anything away and still had all of his engines and many of his planes.

Does this remind you of the leaders in your club and the help that they have unselfishly given to us and, in turn, to R/C progress?

The Golden Age continues to stretch and reach across the oceans. Among others, Arne Friden in Sweden writes to say that he started in R/C at age 14, in 1961, and that he's still with it. Arne wants to add another OT R/C to his lot and needs plans for the Smog Hog (others have expressed the same desire). We also have requests for Doug Spreng's very popular Stormer. Does anyone know a source for either of these?

In response to previous discussions, another letter with further information is from Clarence Lee of Tujunga, CA. Familiar name? OT R/Cer Clarence is so well known for his engine expertise that many may not realize he is one of the very early R/C flyers. He was responsible for some of the first, true R/C engines. We were using converted C/L sport engines while the engine people seemed to be sorting out what power was needed for an R/C aircraft. Not only was a reliable speed control required, but it was becoming apparent that longevity was needed with the extended engine runs R/C brought on. Clarence's first offering was the Lee 45, which showed what a fine R/C engine could be. They were custom-built jewels! Later, his mass-produced Veco versions filled many of our needs. From the beginning of Goodyear Formula 1 racing, Clarence has given his loving touch to the K&B .40s so that many of us could race better. Clar-





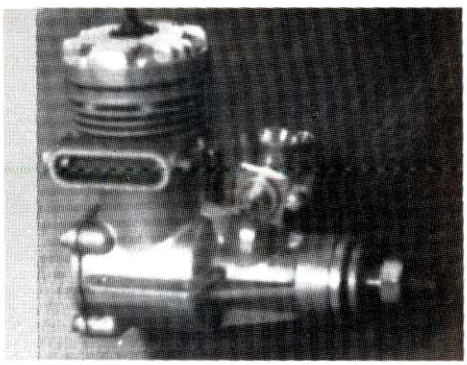
(l to r): ***Early proportional system. Everything forward of servos is receiver. Thank goodness for IC's German Ruppert Boxer diesel, popular in the late '50s. Non-standard K&B throttle employed. O.S. built radios in the '50s also. Single-channel TX shown.***

ence continues his K&B engine blueprinting and custom engine work.

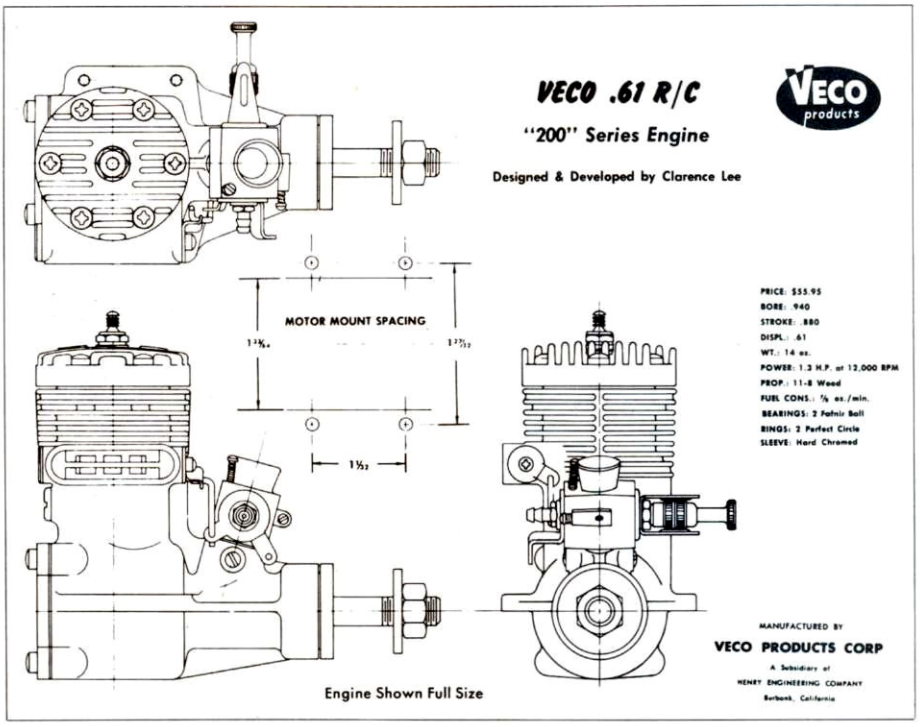
Bud Hartranft pointed the way to future pattern designs with his Voltswagon (flown by Bob Dunham) and then seemed to disappear. Clarence gives us an insight by telling that he and Bud were neighbors after leaving the Air Force. They flew C/L together and then began using R/C. Clarence continued while Bud found other interests.

Another clue from Clarence concerns the German Ruppert Boxer twin diesel, which was widely used for R/C in Europe in the late '50s. Hartranft had acquired one, and he and Clarence wondered what the attached pump was intended for, as it seemed to have no connection to the fuel system. Recently, Clarence received a Ruppert of his own through a GI in Germany who had gotten it from a German friend. Years before, the friend had gotten it from an R/Cer named Stegmier. The last bit provided the answer to the pump question. Stegmier had placed well in the first FAI World Champs, flying a *vacuum-powered* servo R/C system. The pump was for his vacuum supply! How small this world can be!

A while back, we mentioned that Ni-Cds were a giant step forward for R/C. Clarence reminds us of that experience also. In the early '60s, Zel Ritchie was gaining prominence in R/C, immigrating to California from the DC R/C group. Zel was on the leading edge of R/C, sometimes precariously, and quickly recognized the value of Ni-Cds. It is believed that the Ritchie Packs were the first commercial offering of Ni-Cds to R/C.

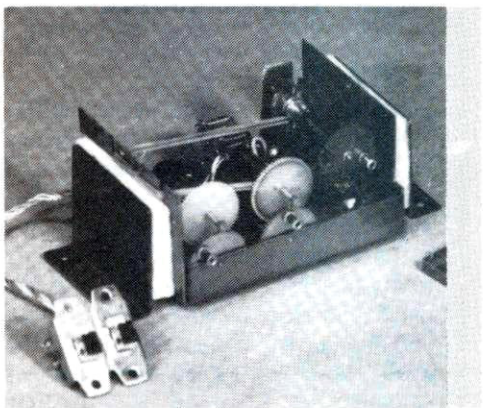


The Veco-Lee RC .61 of the early '60s led the way to modern engines. Note the exhaust baffle linked to throttle.



These Ritchie Packs created considerable consternation among the radio manufacturers, whose systems were developed for dry batteries. As Clarence tells it, the word was that if you used a Ritchie Pack with your system, the warranty would be voided! The reason could have been the lower voltage of the Ni-Cds, but in all probability was because the radio people had a problem with the considerable added cost.

The storm did not last long. Along with others, Doug Spreng marketed a converter which provided not only the needed 1½V, but also the 30V B supply from only four Ni-Cd cells. The advantages of weight and space savings plus rechargeability were obvious. Clarence tells us that Don Mathis converted his Orbit transmitter to Ni-Cds, and Dunham agreed that it worked fine. With such demonstrations, the radios soon came with Ni-Cd batteries—another major step forward.



Another early pulse-proportional servo arrangement. Mighty-Midget motors. Note the method of shock-mounting employed.

In those days, most radio failures were actually dry battery failures. Clarence closes by saying that he still has his retired Stormer and Taurus in his attic, neither having had a radio failure.

We've said that the advent of proportional came in turbulent R/C times, and even added more to the turmoil. Things were happening so fast: single-channel had reached reliability; reeds had become

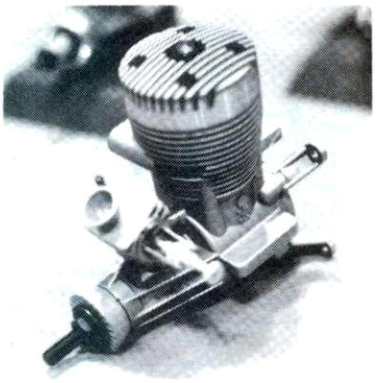
(Continued on page 120)

Pattern Matters

by MIKE LEE

THIS MONTH, I'm a jump ahead of the rest with news from the manufacturers about their 1988 products. Yes, the show season for the R/C industry has begun, and I want to tell you about a few things which I think you'll find interesting.

First, the guys at K&B* have done it again. They've just introduced a new .61-size engine for the sport performance enthusiast. The new Sportster 61 is a large aircraft engine. Like the two previous Sportster engines, this new engine features either beam or radial mounting, a new, metered carburetor, plain bearings and Schneurle scavenging. See the photo and note the oversize cooling fins on the head. These should keep things cool and smooth.



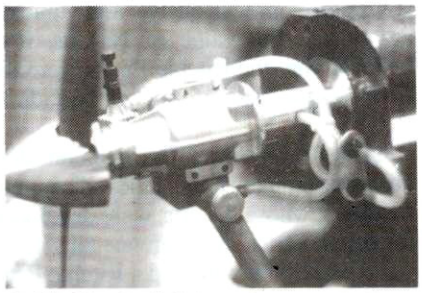
The prototype K&B .61 Sportster continues the approach established with the .20 and .45. Firewall or beam mount, plain-bearing sport engine with good performance.

If you look *really* closely, you can see that there are no holes in the mounting lugs of the engine. That's because this is a prototype engine which we spied in October last year. If this engine performs anything like the other Sportster series engines, the sport pilots will have a powerful and quiet motor to mess with. Looking forward to this one!

A name that hasn't been in the limelight for a while, but certainly promises to be again, is Slimline Mufflers*. Slimline makes custom mufflers and headers for pilots of styles, including pattern jockeys. Slimline is now expanding its line of products with its first product which is not related to mufflers.

Slimline now makes Wing Guards wing covers. These covers are tough nylon sleeves with a layer of sponge rubber inside, which will protect your wings from the ravages of hangar rash and other dangers. Each set has a nylon strap which attaches each cover to the wing with a hook and mesh fabric. Each cover is about 24 inches long, affording good wing protection for almost any size of aircraft wing.

Slimline is also making a new radial motor mount. Cut from bar stock aluminum, the Slimline mount bolts to the rear of your engine and then to the firewall. This arrangement allows quick and easy engine mounting at any angle, without the need for mount drilling and tapping. Our photo shows this mount on an EZ Bud Laser with an O.S. Max 61. Note the clean installation and the fuel line lead-outs. This could be *the* hot setup from now on. Contact Slimline and let Bill Leonard know you saw it here.



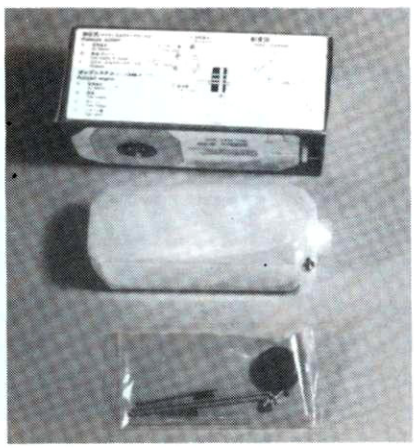
A Slimline backplate motor mount shows simplicity of installation. Machined from bar stock, unit is lightweight and strong.

Our next items come from the heads-up people at Golden Gate Hobbies*. The first is a new, unique tank designed for pressurized fuel systems. If you're a Y.S. engine user, then this applies to you. From Tetra comes a tank with an internal silicone bladder. If you look at the photo, you'll see a small nipple at the lower corner beneath the mouth of the tank. This is the pressure inlet, and this is how it works:

As the engine exhaust or pump (whichever you use) sends pressure to the tank, the pressure is contained inside the tank, but outside the bladder. Inside the bladder is pure fuel with no bubbles or fizz. With the pressure outside the bladder and no air in the bladder to begin with, you not only eliminate air in the lines, but also fuel foaming, fuel backwash to the pipe when the pressure decreases and one-way valves (a la Y.S.). Yes, there is a fuel overflow from the bladder, and everything works just as with other tanks, except where the pressure is held. It's available in 14- and 16-ounce sizes. What an idea!

Look at the next photo. Note that there are a couple of sets of pushrods and a servo. The pushrods are new rods from MK* which feature precise nylon clevises with self-contained positive locks. The other novel design is a clevis molded with approximately 45-degree offset. These are to get around the servo arms without cutting them down to one arm because the clevis hits it. Neat idea, huh? So why didn't *I* think of that?

The last photo shows the servo pictured with the rods. This is an example of a new series of servos from Digicon. Note that next to the servo is what looks like a double-tiered servo arm. It isn't, but it *can* be. You see, each Digicon servo comes equipped with a servo arm that has splines identical to the servo so that you can piggy-back another arm to the first. This comes in handy when rigging up



Tettra bladder tank uses pipe or pump pressure to pressurize tank, while silicone bladder minimizes air bubbles and foaming.

retracts using only one servo for all three retracts; or for some weird aileron hook-up you thought you had licked; or a few dozen other things. The main thing is that these Digicon servos compliment any positive-pulse radio system and they feature coreless, ball-bearing outputs, very high-speed rotation and torques ranging

Bill Leonard holds a Slimline Wing Guard. Nylon with foam protects wings during transportation.

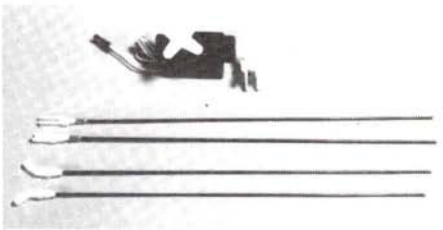
from 1.6kg/cm to 5.1kg/cm (figure that one out on the metric chart). Contact Golden Gate Hobbies for info.

Rumor has it that Hanno Prettner will again have his latest pattern-championship bird brought to the public in the form of an EZ-type aircraft. Aw, heck, it isn't a rumor any more. His Supra Star aircraft, which he flew to victory at the 1987 World Championships, was a prototype of the kit bird. This ship is a direct descendant of the Supra Fly model used to take the previous World Championship. Having flown a couple of versions of the Supra Fly, I can say that the new bird should be a dandy, considering how pleasing the previous ones were. Look to Hobby Shack* for this one.

On a technical note this month, I want to discuss a really basic idea about performing maneuvers: the need to be straight and level on entering a maneuver. I've coached many flyers, most of whom are pretty good pilots in performance, but even they fail to make a simple straight and level entry in. I'll explain why this basic idea is so necessary.

In entering almost all maneuvers, you must have the aircraft in the best possible position to begin execution. This best position, as far as the aircraft is concerned, is straight and level. This applies to inverted flight as well. The reason is rooted in the nature of model aircraft flying. From our point of view (literally), our only point of reference to the aircraft is our sense of sight. We have no false horizon to peek at in the dash, no real horizon to peer at through the windshield and no gut feeling from the plane—only sight.

When we fail to recognize that the ship isn't level, we automatically cause the ship to start the maneuvers crooked. Let's examine a simple loop. We pull the nose up and wait 'til she comes around the circle, hoping that the loop is straight. If the loop is done with the ship either coming right at you or going away from you, you can see how just a little roll on the wings will cause the loop to veer way off line. Well, that's exactly what's happening when the ship appears to *sometimes* require rudder when doing the same loop from right to left.



Digicon servo with piggy-back arms. Novel ideas are the curved MK clevises which are just the ticket for getting rotational clearance.

Unfortunately, our eyes may deceive us when coming parallel with the pilot, making it difficult to recognize a straight and level position on the ship. This will explain why you may feel that you have only made rudder corrections *sometimes* during the loop and not *all* the time. This is one of the hardest judgements to make when flying the pattern, or any other stunt that a pilot may execute. However, it's well worth learning.

To learn how to detect a straight and level attitude, you must learn how to look at the aircraft. This takes many hours of air time during which you become accustomed to seeing the ship in a level attitude. It will also require that you perform your favorite stunts time and time again. This is part of the familiarization process. It will help to have another person there watching the flight and helping you to determine when the wings are level and the stunt is executed straight. Once you're confident of your ability to look at the aircraft correctly, you'll find that the execution of the maneuvers is much easier.

Don't be surprised to find that you'll have to go through this process often, as you change aircraft over time. Each plane is different, and even a different color scheme will change the way a ship appears in the air. It takes time to learn this and is the reason why pilots use similar color schemes on their aircraft over long periods of time. They feel comfortable looking at those colors and can recognize the position of the aircraft when it's flying. Take the time to learn what the correct attitude of your aircraft should be when it's performing maneuvers. Without that straight and level entry, you have already lost the first point and a half to the judges.

Our next subject has to do with the motors we use. I'm often asked about the type of fuel I use, and I reply that my fuel is the same as everyone else's. Yet, unfailingly, some poor fella will knock himself out unsuccessfully trying to start and run a motor, only to find that the motor runs reliably after tanking up with *my* fuel. It mystified me for a while, until I talked to Ed Penn, maker of Av-Gas fuels. In talking with Ed, I discovered that some synthetic oils used as lubes in our fuels are too viscous. I always thought that, after being diluted with the methanol in the fuel, this wouldn't be much to worry about. According to Ed, it is.

Ed states that the oil may be just thick enough to make the fuel resist passing through the small openings in the carb when the engine is at idle. This could be

(Continued on page 114)

Small Steps

by RANDY RANDOLPH

The venerable Dragon Fly, a big airplane with a little .15 engine that snatches it around very well. Helen Randolph cranks.

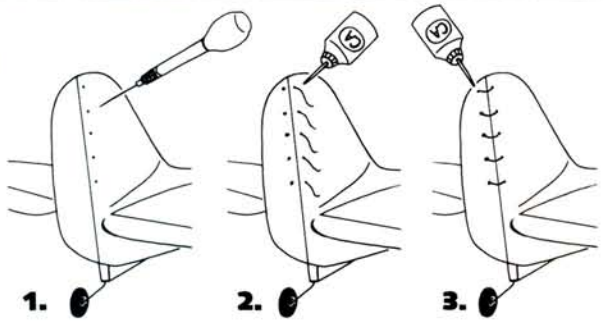
THIS MONTH, IT'S TIME to hear from you, the real experts. The first is Ray Gareau, of Laval, Quebec, Canada. Ray writes:

"...Here are some of my suggestions: For a better engine, run at idle (for the .049) using the Cox* muffler, never use fuel with less than 15 percent nitro, and stay away from the synthetic lube fuels. This will improve the idle by almost 100 percent. Next, to enhance the idle reliability with the Cox muffler, open the spring-clip exhaust regulator so that the opening is about 3/16-inch square. There won't be a noticeable increase in noise, and the idle will be very safe and steady at 3,500rpm. For easy starting, I always use a 2V battery with about 2½ feet of wire, such as speaker wire.

"As for hinge material, I use 30-pound test monofilament leader. With a large needle or pin set in a pin vise, make holes at 1-inch intervals along the rudder and elevator, and then put the monofilament in and glue with CA. Mark, and make holes in the other surface, then line up the monofilament and press it in. When you're satisfied that the surfaces are closely matched, set with CA. For ailerons, the spacing can be about every 2½ inches. They're friction-free, lightweight and low cost. They can be used on all planes that are powered by .15 engines or smaller. My son has used this type of hinging on .40 combat planes with spacing of about ¾ inch, and it lasted longer than the longest-lived combat plane!"

To carry on with Ray's subject: I've seen small airplanes using monofilament for control cable from servo arms to control horns through fair-leads. The monofilament coming from one horn goes through a hole on one side of the servo arm, makes a couple of laps around the center post then goes out through a hole on the other arm. It is then pulled tight and attached to the other side of the control horn. Adjustments are made by removing the control horn from the servo to release the tension on the monofilament and allowing it to slip around the center post. It's a very light and positive system.

John Varsey, Jr. of Austin, MN, writes that he has flown for 67 of the last 68 months. Talk about dedication! John reminds us that landing gears aren't always necessary. He has added 1/32-inch ply to the bottom of his Falcon Jr. and flies it all year round.



Nifty idea for effective hinges; procedure described in text: 1. Make holes in surface. 2. Anchor monofilament with CA. 3. Lace and anchor monofilament to hinged surface.

John commented on another airplane that I'd almost forgotten: the New Era—one of the very best small airplanes. It first appeared in *RCM* and was later kitted by Airtronics. I built mine from the magazine plans and powered it with a Webra .20. It was one great airplane. Mine met its doom because of dumb thumbs and a very hard runway. John still has his!

The next letter highlights a problem that a lot of new flyers have, and it's from Al Whitney, of Nutley, NJ:

"I've been building R/C planes on and off for a long time, but I haven't soloed yet.

"I'm building a Craft Air* Piece O' Cake to try to teach myself how to fly. After I'd built an Eaglet 50 and an Eagle 63 to train on, I discovered I also needed an instructor to help get me going. Then I saw the Craft Air Piece O' Cake in the Tower Hobbies* catalog. This, I thought, was what I needed; something light, slow and crash-resistant. No big motor to drive it into the ground. If I'm ever going to learn to fly, it'll be with this plane!

"I realize that small planes in general aren't the easiest to fly, but if you have the *right* small plane (something that practically flies itself) it will go a long way toward helping you learn to fly."

Al, thank you! You've stated your case very well indeed. The Twiliter series of airplanes shown here in *MAN* are ad-

dressed to just your situation.

A lot of people have written with questions about the Dragonfly—a 6-footer shown in *Model Builder* magazine some years ago. The photograph is of the plane and my wife, Helen. The occasion was a club picnic at which six women, who'd never flown R/C, were introduced to our sport using that machine.

Now something new: Coverite* now has *transparent* Black Baron film. That's good news, because the translucent Black Baron is almost the lightest iron-on film and is on a par with transparent Mono-Kote. With some of the pigment taken out to make the film transparent, it should be the lightest of the plastics and just right for small airplanes. I've been using Mica-film as a lightweight covering for a long time, and I'm very happy with it, but the addition of this new film to the field of lightweight coverings is indeed welcome!

The next item isn't related to R/C, but it does fall under the heading of *small!* There's a new publication dedicated to folded-paper airplanes. It's called *Fly-paper, The Journal of Folded Paper Flight* and is available quarterly, by subscription, from P.O. Box 47186, Wichita, KS 67201. It proposes to cover all aspects of paper airplanes, including contests, designs, records and reviews. Not only are paper airplanes small, but so is the cost of the materials!

Finally, the shortage of pictures in my column is *your* fault! Please send black-and-white prints (not color) with your letters, and we'll show everyone what good, small airplanes look like. After all, you build the best airplanes in the world!

**Here are the addresses of the manufacturers mentioned in this article:*

Cox Hobbies, 1525 E. Warner Ave., Santa Ana, CA 92705.

Craft Air, 6860 Canby Ave., #120, Reseda, CA 91355.

Tower Hobbies, 1608 Interstate Dr., P.O. Box 778, Champaign, IL 61820.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

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We all know how annoying it is to have fuel creep under a decal, causing the edges to curl up, and sometimes have the decal fall off. Graphics simply don't do that. See for yourself. Dip Graphics in raw fuel. Let it sit around for a few days, dripping wet. You'll be amazed to see that Graphics will still stick tight like nothing ever happened. Incidentally, no overcoating is ever required. Graphics are ready to go, right out of the wrapper.

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Some modelers have asked us why we packaged sheets instead of individual numbers. The reason is that it is cheaper to produce a full sheet than individually packaged numbers. Examine the contents of each sheet of Graphics (described fully below) and you'll see what we mean. For example, our 1" numbers cost only 7¢ each. . .stars cost only 6¢ each. . .and stripes are only 8¢ per foot. Individually they would cost twice as much.

This chart shows the contents of each sheet of graphics

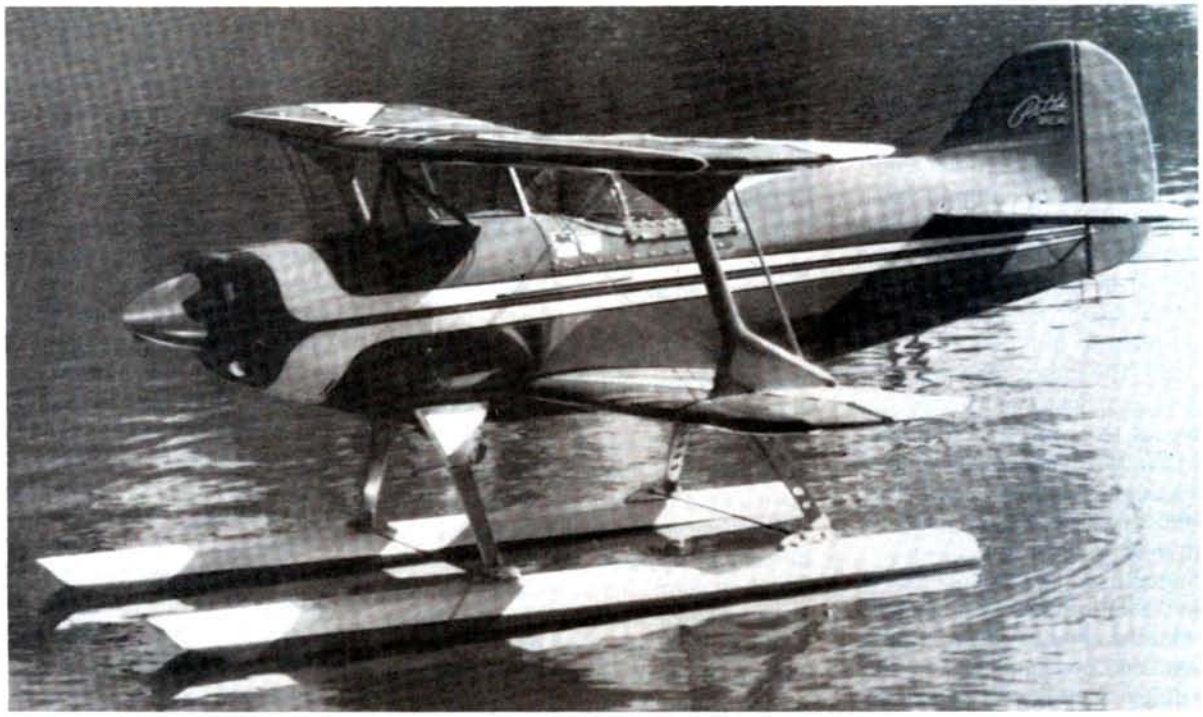
1" NUMBERS	This sheet contains 28 characters: 0123456789 AMA/C 0123456789 AMA/N
2" NUMBERS	This sheet contains 28 characters: 0123456789 AMA/C 0123456789 AMA/N
3" NUMBERS	This sheet contains 28 characters: 0123456789 AMA/C 0123456789 AMA/N

1" LETTERS	This sheet contains 59 characters: ABCDEFGHIJKLMNOPQRSTUVW XYZ ABCDEFGHIJKLMNOPQRSTUVW XYZ A E I O A E I E
2" LETTERS	This sheet contains 61 characters: ABCDEFGHIJKLMNOPQRSTUVW XYZ ABCDEFGHIJKLMNOPQRSTUVW XYZ A E I O ST E I I
¼" & ½" NUMBERS & LETTERS	This sheet contains both ¼" & ½" numbers & letters, with the following characters in each size: AAAABBCCDDEEEEEFFGGHHIII IJJKKLLLMMNNNOOOOPPQQR RRSSSSTTTTUUUVVWWXYYZZ &&1111222333344445555666677777888999900000&&

STARS	This sheet contains 62 stars in four sizes: Four 3" stars Six 2" stars Sixteen 1" stars Thirty-six 1/2" stars
TRIM SHEETS	This sheet contains one 8" x 20" sheet. Big enough for large numbers and special designs: checkerboards, sunbursts & military insignia.
STRIPES	3 sizes in each package: 18 feet of 1/16" 18 feet of 1/8" 18 feet of 1/4" 6 feet of random width

Floating Around

by JOHN SULLIVAN



Bill Curry's 1/3-scale Pitts S1S looks beautiful on floats. Power comes from an OPS Maxi 30 swinging an 18x8 Dynathrust. Weighs 18 pounds.

DURING THE TWO YEARS in which I've been writing this column, readers have frequently asked me to recommend floats for specific planes. It has often been difficult to make a suggestion I could be comfortable with. In some cases, the design of the float was to blame, and in other cases there simply wasn't a suitable float available for a particular model when following the rule that 80 percent of the fuselage length is the required float-hull length.

Photo fly-by of Practical-Scale Pitts on Sullivan floats on its second sortie.

The upshot of all this is my decision to enter the fray by producing a line of foam floats. They come in six sizes and, within specified limits, can be hung from practically any model. I've named the company (with all modesty!) John Sullivan Model Floatplane Products*. The kits include hardpoint stock and complete finishing and mounting instructions. The floats come shipped in their own cores. If you're interested, let me know, and I'll send you a brochure.

Next month, *Model Airplane News* will feature aerobatic aircraft, but I'm a jump ahead. If you were to take a ride in one of these and throw it into a snap roll, you'd quickly find that your head would effectively weigh about 100 pounds, and that you'd have to tense the muscles in your body to slow the flow of blood and prevent a blackout. The experience of flying the International Aerobatic Club Pattern in a 3,300-foot box is like that of being trapped in a working cement mixer for ten minutes—bruises and all.

I don't write from personal experience, nor will I ever! Instead I'm fortunate to be able to feature a 1/3-scale Pitts S1S on floats, which was built by Bill Curry of St. Helena, CA. Bill also owns and flies a Pitts (on wheels) which is only three times the size of the model. Bill built the model to compete in the '88 Scale Masters tournament. His reasons for flying the Pitts on floats include: almost unlimited landing space, better tracking, less worry about dings and wipeouts, and a chance to safely get a feel for the plane while

Paul Weston with his 72-inch scratch-built Whiplash. Fine-looking amphib features swept wing and composite structure.

step-taxiing at high speeds.

Bill has previous experience in these matters. His last project, a Proctor Newport 28, was featured here a few months ago and is a dream on floats, but difficult on wheels.

Bill's full-scale Pitts has been modified externally to accommodate the installation of a 360-cubic-inch, 230hp Lycoming with helicopter pistons, a 10-to-1 compression ratio, polish and balance, etc., and his Practical Scale* model has been altered to reflect these changes. The cowl has been widened to fit flush to the fuselage, the bottom chin is vented, and the rudder has been enlarged to handle torque. Other changes to the kit include the addition of a spring gear, the elimination of dihedral on the bottom wing, a scale interior and instrument panel, and balance spades on the ailerons.

Bill installed an O.P.S. Maxi 30 in the model, but he already hungers for more power and plans to install an O.S. 300 4-stroke twin. The Pitts is mounted on a pair of my 44-inch floats using a duplicate gear blank for rear support along with ⅛-inch M.W. spreaders. Final weight, including a glossy coat of the same Imron used on the full-scale Pitts, totaled 18 pounds for a 25.4-ounce wing loading.

In our haste to fly the Pitts (publishers deadline!), we left off the water rudders, thinking that the enlarged flying rudder might have enough authority on the water. It didn't, so Bill had to gun the O.P.S. and jockey for position on takeoff. The first flight was really scary. Hundreds of hours of work, an unmentionable number of dollars, and intimate knowledge that the full-scale version is a wildcat don't exactly make for peace of mind. After the first landing, there was some talk of nicknaming Bill; one suggestion was "Quivering Curry"! More important, he gassed up the Pitts and flew again—this time almost as smoothly as his Newport flies.

Bill looks forward to a really good time with this model. He's now installed water rudders on the floats, finished more of the scale details, picked up a few more props to experiment with and can't wait to try it. For those of you who are interested in the Practical Scale kit, I've included an address for Practical Scale in West Germany with the hope that it will help. I don't know of a U.S. distributor for this kit.

There's an almost surreal element to the Pitts story that I'd like to pass on. During the past two years when Bill has flown with us at the lake, he would sometimes leave our Sunday-morning sessions early, get in his Pitts and fly over the lake on his way to a practice session at New Jay. We've seen the full-scale Pitts roll and loop and tail-slide, and now we're seeing the model do the same thing in the same setting, and the difference is just not that great. Reality has taken on a new dimension, and the experience has given me a new appreciation of what we do as modelers.

Bill Bachman's scratch-built Supermarine S-5 won "Best of Show" at Umpqua Valley '87 Float Fly.

Another modeler I appreciate is Paul Weston, of Bellview, WA. A while back, I showed a picture of a Delta that Paul had built, and I promised to provide more information in a future column. In the meantime, Paul has completed a larger, swept-wing version of that first plane, and he sent along specs on the new craft, which I show here. Incidentally, Ed Westwood sent a video of the two planes, and I can tell you that this is another experiment in controlled terror. Ed had such a problem keeping the swept wing in view that he has named it "The Western Whiplash." The Whiplash is Paul's second seaplane, and it was designed as a ¼-scale version of a non-existent full-size, two-place tandem amphibious seaplane. It's basically a flying wing with planing surfaces added to the forward projecting midwing area and a tail added for better control. By using the wing for floatation, the engine can be mounted closer to the water and still be protected from spray.

Are you **sure** *you want to do this? Gary Korpi releases Bill Curry's ½-scale Pitts on its maiden flight.*

This also puts the thrust line closer to the CG, and the pusher, blasting directly onto the relatively small tail surfaces, allows good rotation and control with comparatively less drag.

The model is of composite construction. An interlocking egg-crate-type structure forms the basic foundation, and this is then sheathed with a layered fiberglass/balsa/fiberglass skin. The plane is extremely strong, light and waterproof. The span of the Whiplash is 72 inches, and it has a 58-inch fuselage and a 27-ounce wing loading on a 6-to-1 aspect-ratio-modified NACA 64412 airfoil. Power comes from a .90 Como with the bearing case rotated 90 degrees to allow reverse rotation and the use of a standard prop.

Paul says that flying the Delta is exhilarating, but hard on the nerves. The swept-wing Whiplash, however, is much more gentle and easier to fly. Both are definitely out of my league. At one point in the video, Ed Westwood announces that Jim Hursch, a Sig representative in the Northwest who was flying the Whiplash, was going to throw both sticks to the inside top corner at the same time. What followed was four unbelievable lomcevaks in a row—tumbles, cartwheels and all—with the Whiplash exiting the maneuver as if nothing had happened. Regrettably, Paul doesn't intend to publish plans for the Whiplash unless R.U. (our esteemed editor) can strong-arm him into doing so.

By the time this issue hits the stands, the flying season will be in high gear across the country. I encourage all of you to attend a float-fly this year. The Lake Havasu Desert Hawks' meet is already history. The Umpqua Valley Modelers hold a big one every year near Sutherlin, OR. Ace R/C will sponsor their first float-fly at Higginsville, MO, in '88 and, the granddaddy of them all, the Clearlake Modelers annual seaplane fly-in, is scheduled for May 13, 14, and 15 at Library Park in Lakeport, CA.

I'm convinced that when you get somebody to have a lot of fun you score a couple of points somewhere where points mean a lot. Fly a floatplane this year! Get some points for me; have a great time; tell someone else and get some points for yourself. We have nowhere to go but up!

**Here are the addresses of the companies mentioned in this article:*

John Sullivan Model Floatplane Products, 1421 Second St., Calistoga, CA 94515.

Practical Scale Models, Lubbecke, Federal Republic of Germany.

PAUL MANTZ

(Continued from page 79)

Clarke, Pancho Barnes (the first woman precision flyer) and Roscoe Turner. It's also an era that's unrivalled for the variety and beauty of the planes that were flown—from the Bleriots and Spads of World War I to the B-17s, B-25s and P-51s of World War II.

Pacific Wave is making a film that will fully examine the past glories of aviation. It's also making a film about the personal struggles, dilemmas and triumphs of a man whose commitment was always to be the best possible, a man who didn't know the meaning of, "It can't be done." He was a man who daily lived with danger and death. "I think, sometimes, death has ridden co-pilot with me on every flight, waiting for me to make a mistake," he said.

Pacific Wave plans to make "Hollywood Pilot" a fitting and accurate re-creation of the life of this man who flew the best, flew with the best, and *was the best*. With state-of-the-art sound and cinematography (fields in which Mantz himself made many innovations and at which, as a director, he excelled) and today's top pros in precision flying, this film will rivet the audience to its seats with the thrills, excitement, terror and exultations of Mantz's stormy career both in and out of the cockpit.

Combining all these powerful, built-in attractions with the fascinating, ebullient personality of Mantz and the exhilarating feats of flying, "Hollywood Pilot" promises to be a winner—an outstanding movie of lasting impact that will capture the hearts and imaginations of audiences everywhere. As one film-industry insider commented, "It's a classic waiting to happen."

The Group welcomes correspondence with those who can share their enthusiasm and recognize the potential of the Paul Mantz story as a major motion picture. Anyone wanting further information on the project can contact the producers directly c/o The Pacific Wave Film Production Group, Inc., 33 Cervantes Blvd., San Francisco, CA 94123. ■

ENGINE REVIEW

(Continued from page 52)

end of the crankshaft has an 8mm ISO Metric Fine (M8x1.0) thread, and the prop-retaining washer is a substantial, aluminum pressure casting. This is partially recessed at the front to take two conical spring washers between it and the hexagonal prop-retaining nut.

- Crankcase backplate and timing shaft. The 50mm-o.d. backplate that encloses the crank chamber is secured with four 3mm hexagonal socket-cap screws and has a central boss containing two 8x12mm needle bearings. These have twelve caged needles and support a counterweighted timing shaft. The outer end of the shaft is reduced to a 6mm diameter, and to this is fitted a 10-tooth pulley, which is keyed to the shaft with a Woodruff key and retained with a 5mm hexagonal nut.
- Cylinder-liner and piston assembly. With the exception of the large OPS "Maxi" 2-strokes, every OPS motor made since this type was established twenty years ago has featured ABC (an aluminum piston running in a brass cylinder liner with a chromed bore). A similar combination is also used for this, the company's first 4-stroke. The only difference is that in the interests of easier handling with an engine of this size, the 20-4 OHC has a ringed, instead of a ringless, piston.

(Continued on page 98)

ENGINE REVIEW

(Continued from page 96)

The 20-4 OHC is considerably "oversquare," having a stroke/bore ratio of less than 0.77. The 32mm-bore cylinder liner has a wall thickness of 1.5mm and fits into the main casting, where it's located, in the usual way, by a flange at the top.

The piston is a slipper type with a maximum skirt length of only 20mm. The piston head has angled depressions to provide clearance for the valves and, between these, the piston crown is raised in a small shallow central cone, presumably to reduce chamber volume and maintain the required compression ratio. Complete with its single compression ring, the piston checked out at a moderate 16.7 grams. The short (22.5mm), hollow, 6mm-diameter wristpin, which is retained by wire circlips, increases total piston weight to exactly 20 grams.

The connecting rod is machined from high-duty aluminum alloy bar stock and is fairly short—40.7mm (1.66 x stroke) between centers. It has a plain, unbushed eye for the wristpin, but has an uncaged needle bearing at the crankpin end. This isn't a common feature on current model engines. The needle bearing consists of 22 loose needles, 6.3mm long x 1.0mm in diameter, which fill the annulus formed between the crankpin and the hardened steel race contained in the conrod. If you have to remove the crankcase backplate, you should do it with the crankshaft pointing downwards, or the tiny needles will fall out and may be easily lost.

- Cylinder head. Made of pressure-cast aluminum, this is generously finned at the side and front like the cylinder casing. It's tied to the cylinder casing with four 4mm hexagonal socket-cap screws. It has a hemispherical-type combustion chamber in which the valves are inclined at an angle of 60 degrees. In the classical manner, this has enabled two larger-diameter (14mm) valve heads to be accommodated within the confines of a head that is reduced from the 32mm of the cylinder bore, to a 29mm-diameter combustion chamber.

The head has the usual bronze cup-type combined valve guides and seats. The valve throats are very large with a 12mm diameter, and the ports through the head have an equally generous 10mm diameter. The glow plug is inclined at the same angle as the valves and is located in front of and between them.

Our test engine had a 0.10mm (.004 inch) soft-aluminum gasket between the head- and liner-joint faces and, with this installed, the nominal compression ratio worked out at 7.3-to-1.

- Camshaft and bearings. The camshaft bearings, consisting of two 8x12mm caged-needle bearings, are installed in a housing that is an integral part of the cylinder head. They support the center, rather than the two ends, of the camshaft. The cam lobes are at the front end of the camshaft while, at the rear, the shaft is reduced to a 6mm diameter for the drive pulley. The pulley is of molded GRN (glass-reinforced nylon) and has an aluminum hub that is slotted to engage a roll-pin through the shaft. The pulley is retained by a 5mm hexagonal nut. The U.S.-made toothed drive belt is 9.5mm (⅜ inch) wide.
- Valves and rockers. Unlike some recent model 4-strokes, the intake and exhaust valves of the OPS are the same size. Also, the rocker ratio is 1-to-1, so valve lifts are nominally the same as the cam lifts—3.0mm. Designed valve lift is usually linked to valve-throat diameter (d). At 0.25d, the OPS's valve lift is modest but, in this instance, is offset by the fact that throat diameter (12mm) is, as previously stated, very large for a cylinder of this size.

The stainless-steel 14mm valves are 31.8mm long and have the 3mm-stem diameter common to most model 4-strokes, both large and small. Valve springs are retained by aluminum-alloy collars and horseshoe retainers. The hardened-steel valve rockers are mounted on 4mm diameter bronze rocker shafts drilled for lubrication. The rockers have the usual screw adjusters in contact with the valve stems but, unlike certain full-size engines using rockers to operate inclined valves from a single camshaft (e.g., BMW), flat-finger-type rocker surfaces are used in contact with symmetrical cams. This means that acceleration/deceleration rates are different; the inlet valve opens quickly and closes slowly, whereas the exhaust valve opens slowly and closes quickly.

All other visible parts of the valve gear are enclosed within a detachable pressure-cast, finned, aluminum head cover.

- Carburetor and inlet pipe. In contrast to the semirotary barrel-throttle carburetors fitted to most model 4-stroke engines, the 20-4 OHC uses a slide-throttle-

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Product News

SUPERMAX AEROBATIC

Aerobatic trainers don't have to be ugly. While the sleek lines of the Robbe Supermax remind you of a full-scale airplane, it was designed to be a high-performance but docile trainer. Using a 4-stroke engine, the Supermax can perform any maneuver. The extremely rugged Plura fuselage, combined with the sheeted-foam wings and many other ready-to-install components, saves a lot of building time. The kit contains the pre-fabricated Plura fuselage; sheeted Siros foam wings with pre-shaped leading edge; machined balsa tail surfaces and a complete hardware package.

For more information contact Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.

NEW .40 and .45 ENGINES

For more than one year, Aristo-Craft/Polk's Model Craft Hobbies has been working on its new .40 and .45 aircraft engines. They're finally ready! These engines are loaded with everything. Both engines feature a large carburetor with two adjustments, ball bearings, an AAC piston-cylinder combination, a muffler, and a smooth, die-cast finish.

For more information contact Aristo-Craft/Polk's Model Craft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304.

SHOCK STRUTS

Impact Engineering announces the SS Series of Shock Strut Landing Gears. Shock Struts truly meet the scale and sport fliers' demands for detailed, operational landing gear. Tests of the struts on dirt, grass and hard surfaces have proven their capability to absorb the hardest of landings while keeping the rebound effect (as experienced with music wire and aluminum gear) to a minimum. Shock Struts have a scale, detailed appearance, an easy universal installation on fixed and retractable gears, selectable scissor positioning (no left or right) and a music-wire axle. The Shock Strut housing is made of aircraft-grade aluminum bar stock (6061-T6) and is machined in one piece to form a strong, lightweight structure.

For more information contact Impact Engineering, 2100 Stonehill Ct., Arlington, TX 76012.

KYOSHO FLASH

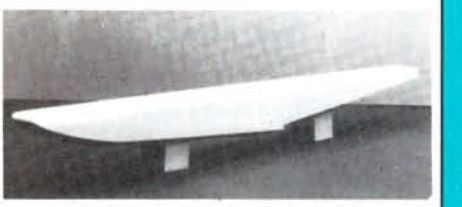
The new Kyosho Flash is a unique ARF plane. Designed by the top Japanese pattern flier, Tsugutaka Yoshioka, the 47-inch wingspan Kyosho Flash is capable of pattern or aerobatic performances never before possible with any electric plane. The semi-symmetrical airfoil enhances the plane's aerobatic capabilities, and the LeMans 240E motor with gear reduction gives it enough power for ROG performance.

For more information contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

.074 QUEEN BEE ENGINE

A completely new development in throttle and muffler design, the Cox .074 Queen Bee engine brings a new dimension to R/C flying. Filling the gap between 1/2A and .10 engines, the Queen Bee provides sport fliers with a powerful, quiet engine. With a true carburetor and throttle, the .074 Queen Bee delivers a broad range of rpms. An efficient muffler, designed specifically for the Queen Bee, provides quiet flight with minimum power loss. With dependable reed-valve design, extruded aluminum crankcase and ball-and-socket piston/rod assembly, you can depend on the .074 Queen Bee for trouble-free performance.

For more information contact Cox Hobbies Inc., 1525 E. Warner Ave., Santa Ana, CA 92705.



SUPER FLOAT KITS

Len's R/C Enterprises has recently introduced its line of Super Floats. These are vee-bottom, performance-oriented floats designed to perform in calm or rough water. Sizes range from 28 inches to 60 inches in 2-inch increments, and the floats are available in standard and sport-scale versions. The Super Floats are a combination of epoxy fiberglass and a super-light foam, which makes the floats strong, unsinkable and easy to build.

For more information contact Len's R/C Enterprises, Box 214 Montrose, B.C., Canada VOG 1P0.

METHANOL

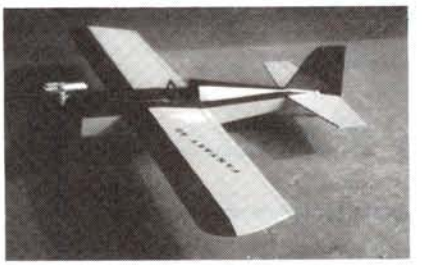
Many of the fliers who are changing from the chainsaw-type engine to the large 2- and 4-stroke engines are mixing their own fuels. This can result in considerable savings. Many of these new engines can tolerate fuels with a much looser oil content and little or no nitro. This makes methanol an excellent fuel choice. Klotz KL100, which is available through Wing-Tip chemicals, is one of the few oils that mixes well with methanol, as well as with nitro and gasoline.

For more information contact Wing-Tip Chemicals, 526 North 3rd E., Riverton, WY 82501.

SELF-FEATHERING PROP

With increasing interest in electric flight, new kits and accessories such as Windsor's new Self-Feathering Adjustable Pitch Propeller are making their appearance. The Self-Feathering prop, which is designed for .05 electric motors, has a patented feathering mechanism that will greatly reduce drag in the glide mode and change instantly to a preset pitch for powered flight. Pitch adjustment is made with a 4-40 setscrew, which is instantly accessible through the spinner cone. Hex keys for pitch adjustment and mounting the self-feathering prop to the ⅛-inch motorshaft are included.

For more information contact Windsor Propeller, 384 Tesconi Court, Santa Rosa, CA 95401.



FANTASY 40

The Fantasy 40 from Crenshaw Aero is a sport aerobatic plane that has been thoroughly test-flown and exhibits great stability and response at both fast and slow speeds. The kit features balsa and plywood construction with parts that are cut and sanded. The kit includes rolled plans and a hardware package. The Fantasy 40 has a wingspan of 56 inches, a wing area of 580 square inches, and it will accommodate a .35 to .60 2-stroke or a .60 4-stroke engine.

For more information contact Crenshaw Aero, 423 W. Washington, Shelbyville, IN 46176.

KADET SENIORITA

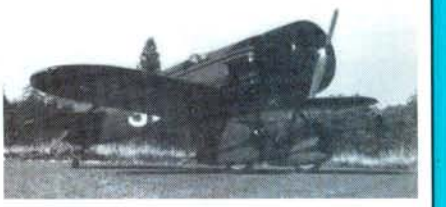
The Kadet Seniorita, from Sig Manufacturing Co., Inc., is a smaller version of the Kadet Senior. It features the same stable and forgiving flight characteristics. At average weight, the wing loading is a very low 12 ounces per square foot. The Seniorita cruises effortlessly in low power, giving the student flier the time to think, without the panic that faster models often induce. In a tight spot, take your thumb off the sticks and let the "hands-off" ability of the Seniorita return you to stable flight. The Seniorita will accommodate a .15 to .25 2-stroke or a .21 to .35 4-stroke engine and it has a 63-inch wingspan, a 746-inch wing area, an average weight of 62 ounces and is 50 inches long.

For more information contact Sig Manufacturing Co. Inc., Route 1 Box 1, Montezuma, IA 50171.

¼-SCALE MAULE M6

The ¼-scale Maule M6, from Ikon North West, is designed to accommodate today's new opposed twin engines. It features a 92.5-inch wingspan, and the wings, which are fitted with flaps, unbolt for easy transportation. Ikon will offer the Maule with a cowl and a molded windshield from Fiberglass Masters. The kit includes pre-cut wood pieces, pre-bent landing gear, and blueprints with a drawing of the full wing.

For more information contact Ikon North West, P.O. Box 306, Post Falls, ID 83854.



1929 TRAVEL AIR MYSTERY

The 1929 Travel Air from Golden Age Models is a beautiful ⅕-scale kit that features a lightweight epoxy-glass fuselage, cowl and wheel pants. Other features include select wood for durable construction, a complete hardware package, decals and an instruction manual with three view drawings. The Mystery Ship has a 70-inch wingspan, 800 square inches of wing area, is 49 inches long and will accommodate a .90- to 1.6-cubic-inch 2- or 4-stroke engine.

For more information contact Golden Age Models, P.O. Box 807, Penn Valley, CA 95946.

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee of performance by **Model Airplane News.** When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**

ENGINE REVIEW

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type carb. This is similar to those seen on many current OPS 2-strokes, particularly the car-type motors. It incorporates manually adjustable automatic mixture control, via a secondary needle mounted in the throttle barrel. There's a bellcrank to convert the transverse slide movement to a normal fore-and-aft linkage to the throttle servo. The carburetor has a throat diameter of 8.8mm and, after allowing for the spraybar and mixture-control needle, the effective venturi is an uncommonly large 40 square millimeters.

The inlet pipe is made of 10mm-i.d. stainless-steel tubing and is connected to the carburetor with a synthetic-rubber elbow. Attachment to the cylinder head is through a pressure-cast aluminum elbow containing two O-rings.

- Exhaust pipe and muffler. The exhaust pipe is also made of 10mm stainless-steel tubing and is secured to the cylinder head with a steel gland-nut.

The muffler, which has a volume of 35 milliliters, is fitted over the end of the exhaust pipe. It's clamped to the exhaust pipe internally with a worm-drive-type hose clip. It contains a perforated baffle tube for noise reduction and has an 8mm-i.d. outlet nozzle, giving an outlet area of 50 square millimeters.

PERFORMANCE: The manufacturer's instruction manual for the OPS 20-4 OHC contains the following recommendations:

- Mounting. OPS anti-vibration rubber supports (part No. 9880) are recommended for installing the engine in a fiberglass fuselage. For wooden fuselages, the engine can be mounted directly to the firewall.
- Fuel. A mixture containing 12 percent castor oil, 5 percent nitro-methane and 83 percent methanol is specified. We made up this mixture for our tests. If you don't have access to these materials, you may need to contact the importers for their recommendations regarding an approved ready-mixed commercial fuel.
- Glow plug. An OPS hot-rated plug (part No. 9150) is supplied with the engine, and replacements should be of the same type. For safety, use only the special extended, side-fitting glow plug clip, which is supplied with the engine.
- Muffler. OPS states that the pressure connection from the muffler to the fuel tank should always be used. This implies that the engine shouldn't be operated without the muffler, even in areas where there are no restrictions on noise levels to

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ENGINE REVIEW

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prohibit this. This recommendation is understandable in view of the carburetor's large, venturi throat area, as this must inevitably reduce fuel suction and therefore require assistance to maintain an uninterrupted supply of fuel through maneuvers.

- Propeller. An 18x6 propeller is suggested for breaking in. The test results indicate the alternative prop sizes that may be used for flying.
- Valve clearances. The engine is supplied with a 0.2mm strip of steel shimstock for setting valve lash. Equivalent to .008 inch, this is a somewhat greater clearance than is recommended for other model 4-strokes. I assume that the factory regards such a clearance as more in keeping with an overhead camshaft engine. On the other hand, with pushrod engines, the expansion of the (aluminum) cylinder-block is much greater than that of the steel pushrods, thereby increasing valve clearances as these engines reach their running temperatures.

No choke valve is fitted to the 20-4 OHC and, since the carburetor intake is inaccessible for finger choking, an alternative method of priming the engine for a cold start has to be found. The instruction manual advises removing the glow plug and priming through the plug hole.

This is acceptable, but the plug hole is at an angle which is more difficult to judge than a vertical one. Be careful, when replacing and retightening the plug, to avoid any risk of cross-threading it and ruining the cylinder-head. To eliminate such risks, prime through the exhaust port instead. Always make sure that the engine isn't over-primed; gently rotate the crankshaft through the compression stroke a couple of times before you attempt to start it.

When the engine is fairly warm, it may be restarted without repriming by reapplying the electric starter with the throttle closed to just above the idle setting. Alternatively, if the engine has cooled off to the extent that priming is necessary for a restart, open up the needle valve to the starting setting, and then place a finger over the muffler outlet while rotating the prop by hand to pressurize the tank and thereby pump extra fuel into the carburetor.

As is revealed in the accompanying performance graph plotted from our test results, the factory's claim to have concentrated on achieving improved per-

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ENGINE REVIEW

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formance in the 5,000- to 9,000rpm range is fully justified.

Maximum torque was indicated in the region of 5,500rpm, while maximum brake horsepower was determined at 8,800rpm. Allowing for an average of 10 percent rpm build-up in level flight, this shows that, with props of 6-inches pitch, the engine is well suited to minimum and maximum diameters of between 16 and 20 inches, or 1- to 2-inch smaller diameters in the case of 8-inch pitches.

The OPS is, in fact, capable of turning larger props quite easily. As is well known, many 4-strokes have a tendency to detonate or "ping" when loaded with oversize props. The OPS showed no such tendencies, even when, as a final experiment at the end of the tests, we loaded it down to an all-time record full-throttle low of 3,600rpm on a 22x10 prop, such as might otherwise be used on a 40- to 50cc engine. Other static rpm achieved on tests include the following:

4,200 on a 22x6 Airflow beech
4,250 on a 20x10 Top-Flite maple
4,950 on a 20x8 Top-Flite maple
5,500 on an 18x10 Zinger maple
6,500 on an 18x8 Zinger maple
6,700 on an 18x6 Zinger maple
7,400 on an 18x6 Top-Flite maple
7,300 on a 16x8 Airflow beech
7,600 on a 17x6 Airflow beech
8,100 on a 16x6 Top-Flite maple
8,900 on a 14x8 Airflow beech

The engine's ability to cope with large props clearly establishes it as a candidate for FAI scale-type aircraft, where engine displacement is limited to 20cc, and it's especially suitable for the larger slower-flight types.

General handling characteristics were good, with the exception of the needle-valve adjustment which was so fine that considerable movement was necessary to find the optimum mixture setting. The throttle, however, worked well (after a minor adjustment), with safe idling between 1,700rpm on a 20x10 prop and 2,000rpm on 18-inch diameters, without re-energizing the plug.

We encountered only one minor problem with our test engine. When the prop was removed, we discovered that the prop driver tended to slip forward off the brass, split, tapered collet. If, at the same time, the shaft was located so that the

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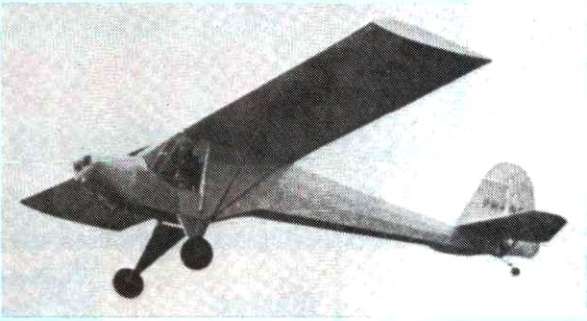
NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Gary Finkelstein of Rockaway, NJ, for correctly identifying the FFA P-1604 (Flug and Fahrzeugwerke AG) fighter bomber. Designed to meet the requirements of the Swiss Air Force for a fighter/bomber, the Armstrong Siddeley Sapphire-powered P-1604 experienced flight-test difficulties throughout its development. Some of the design, however, lives on today in the Lear series of executive jets, as Bill Lear bought the rights to the P-1604 and mated the wings and tail group to a passenger-carrying fuselage, and this resulted in the Lear Model 23.

We didn't think identification would be quite that easy, but 22 of you submitted the correct answer!

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Club of the Month

Westminster Aero Modelers

The Westminster Aero Modelers from Westminster, MA, is the *Model Airplane News* "Club of the Month" for May 1988.

This "humble" club (as it's called by its vice president, Arthur Perry) is a small but growing group with 38 members ranging in age from 12 to 80! The WAM is an AMA-chartered club that was founded in 1955.

The WAM sponsors an annual dinner and, according to the club president, Bill Hasert, this event usually attracts some notable figures in the aviation world.

The club's newsletter, "The Talespinner," is put together by Arthur Perry. It features a column in which the president keeps the club informed of the latest news, and it also includes a list of outside functions, a schedule of club events, information on full-scale aviation firsts, and details of all club happenings. One section that caught our eye was a column on safety which focused on the handling of model-airplane fuels. Many seasoned fliers have the misconception that they know all there is to know about handling fuels, and it's usually these "experienced" ones who sustain the most injuries! This section is also helpful to the enthusiast who has just entered our great sport and needs this kind of vital information ... Bravo!

Another interesting item in the newsletter is the club's "Cub" project. It seems that the club has made a collective effort to assemble a Balsa USA ¼-scale Cub. The project began over four years ago and, with all the club members pitching in, they saw the end result of their labors take to the sky this past August. This kind of creative club activity is a credit to the founder of the project, as well as to the club as a whole. It brings members together to share their years of building experience and ideas, and it also gives not-so-experienced modelers the best hands-on experience they can get.

We at *Model Airplane News* are pleased to award the Westminster Aero Modelers two free, one-year subscriptions, which they can give to a couple of the club's out-standing members. Congratulations! ■

Each month **Model Airplane News** will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). **Model Airplane News** will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to **Model Airplane News**, Club of the Month Contest, 251 Danbury Rd., Wilton, CT 06897.

ENGINE REVIEW

(Continued from page 106)

Woodruff key was on its underside, the key could drop out.

To guard against losing the key, we had to rotate the crankshaft to its top dead-center position so that the key could be seen when the prop driver was loosened. This also permitted the key to be checked when the prop driver was slid back over the tapered collet. If this check wasn't carried out, the key could slip backward and upward, out of the keyway. The end of the key could then foul the ends of the large circlip retaining the front ball bearing and prevent the shaft from rotating.

Of course, this problem (if it occurs with other examples) will only arise when, after being loosened, the prop driver is refitted. The Woodruff key cannot slip back when the prop driver is firmly in place. It's simple to check the position of the key before sliding the prop driver over the tapered collet.

Before concluding the test session, a few checks were made with the muffler removed to determine whether this substantially lowered the engine's power output. As expected, the muffler was responsible for steadily rising power absorption as prop sizes were reduced below 16x6, but there was virtually no difference in performance, with or without the muffler, on the larger and more useful prop sizes. ■

PATTERN MATS.

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the case, especially when the engine normally operates under pressure at high throttle and almost no pressure at idle. At high speed, the fuel is *pushed* through a fairly good-sized spray bar and at a relatively high volume. At idle, the pressure (exhaust or manifold pressure) falls off to zero, and the engine must now *suck* the fuel from the carb. (This is not always the case, as a pumped engine will maintain its pressure.)

Ed has a point, as, if the fuel is even slightly thick, it may have trouble finding its way through the spray bar and down the throat. If this occurs, even for a second, the engine will die. This would explain why using old fuels, even if they've been well kept in metal containers and in dark storage, will cause erratic engine runs.

Back to the heavier lubes. Ed went on to say that the use of synthetic lube (a high-grade lube) is good and shouldn't

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Classified

WANTED: RTF U-Control planes from Cox, WenMac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, tanks, for GHQ, O&R, O.K., many others. Large catalog $4.00 pp. Chris Rossbach, RD 1, Queensboro Manor, Gloversville, NY 12078.

HARDWARE AND SOCKET HEAD cap screws, all sizes, low prices. Write for complete list. Example 6-32x1" only $4.25 per hundred. Micro Fasteners, P.O. Box 42A, Netcong, NJ 07857.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; 918-245-3649.

WANTED: Model engines made before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; 806-622-1657.

WANTED: GERMAN DIESEL, (e.g., Taifun, Webra, Jaguar) or early glow engines (e.g., Webra Big Ben 5cc, Webra Sport Glo A956), only new or NIB. Also German free flight and early R/C-kits. Will pay fair prices. Dr. W. Sturn, JM Strasser Feld 29, D-512 Herzogenrath, W. Germany; 2406-5952.

SCALE DOCUMENTATION: PLAN ENLARGING. Photo packs, 3-views, drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport; 43-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; 919-292-5239.

BUILDING BOARDS. Flat, warp-resistant, 3/8-inch pinnable surface, 16 inches wide, 48 inches long. Free brochure. Limestone Enterprises, Box 586-MA, Athens, Alabama 35611.

BUILD AND MAINTAIN YOUR OWN ELECTRONICS. Battery cycler, constant current charger, digital ESV, etc. Radio Shack parts. Very complete instructions for the non-electronics person. Satisfaction guaranteed. Business size SASE for information. Lico Electronics, 700 NW 7th Ave., Boca Raton, FL 33486.

AIRCRAFT RESEARCH: Need rare aircraft documentation, photos, three-views? Send requests with $1.50 U.S. for sample information. Mr. I.A. Ross, 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

NO. 11 CRAFT/HOBBY BLADES. Super sharp carbon steel, made in USA. 100 pack $8.95, 10/100 packs $69.50 delivered. Berkeley Trading Co., Dept AA, P.O. Box 26, Berkeley Springs, WV 25411. Visa/MC welcome.

ENGINES: IGNITION, GLOW. Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; 619-375-5537.

SEMI-KITS FABRICATED from your plans. Parts cut from balsa, bass, pine, maple and plywood. Custom wood sizes and shapes cut from your specs. Send SASE for quotes. Model Wood Specialties, 4209 24th St., Kenosha, WI 53142.

CUSTOM EMBROIDERED PATCHES. Your design made any size, shape, colors. Five patch minimum. Free random sample and brochure. Hein Specialties. 4202K North Drake, Chicago, IL 60618-1113.

TOOLING: Molds, tooling, fixtures and parts to manufacture 60 size ABC engines. Have some finished parts and some still needing machining for 200 engines. For more information please call (818) 767-8909.

BEGINNERS, discouraged by too-fast "trainers"? Send $1 and two stamps for no-holds-barred evaluation of over 20 popular R/C trainers rated for their ease-of-flying. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

TOOLS FOR SERIOUS MODELERS. Highest quality surgical steel. Standard Kit includes: needle forceps, needle probe, dental mirror, hemostats—$15.95. Deluxe Kit includes Standard Kit plus curved needle forceps, large hemostats—$24.95. We Pay All Shipping. SECOA Modelers, POB 162123, Ft. Worth, TX 76161-2123. Offer good through July 31.

CLEARING OUT OLD MAG ACCUMULATION *M.A.N., A.T. Flying Models* and others. Send self-addressed, stamped envelope for list. Fruciano, 6146 E. Cactus Wren, Scottsdale, AZ 85253.

PLANS ENLARGED, Model Drafting Software, Ni-Cd Monitoring Software, Scale Data. Free catalog. Concept, PO Box 669E, Poway, CA 92064; (619) 486-2464.

"ENGINES'" SPRING SPECIAL: ¼-scale "Cyclone" Engine 2.4 C.I.D. Same weight & size as Quadra, but more power. Only $89.95; Mount, $10.95; Spring starter, $12.95. MasterCard and Visa + 5%. For more info send S.A.S.E. + $1 to Engines, 14925 Kilbourn Ave., Midlothian, IL 60401.

FOR SALE: Scale kits by Platt, Royal, Top Flite. Radios, engines, more. S.A.S.E. for list. C.A. Abernathy, 10206 Windbluff Dr., Richmond, VA 23233.

Send ad and payment to *Model Airplane News,* 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

PATTERN MATS.

(Continued from page 114)

cause any problem at the spray bar. The use of pure castor lube won't harm the flow either. But mix a highly viscous oil with anything and you may have trouble. It pays to shop around for a fuel that works well in the engine for the type of flying that you do. Once you find that fuel, stick to it. There are many who will simply use the cheapest fuel they find at the hobby shop, and also have no qualms about using any fuel which happens to be on sale. These are probably the same people who end up borrowing *my* fuel when their motors don't run correctly. If you want trouble-free, reliable flying, find a good grade of fuel and stay with it. It may cost more, but at least you won't end up using it to start the barbeque.

My last topic also concerns engines, but *this* information comes from Duke Fox. The Duke has been manufacturing model engines for most of his life and he's made some killer motors. Among them are the motors most often seen in control-line combat. They are not only economical, but also powerful. Duke has been placing small ads in *MAN* for a while and I urge you to read them. He gives priceless advice on the running and care of the motors advertized, and most of his advice applies to everyone using any brand of motor.

For instance, did you know how to tell when the nitro content is correct for the engine you are running? I just kept using more nitro until the plugs vaporized! The Duke says that you start the motor and run it at your normal mixture setting—full throttle. After fifteen seconds or so, reinstall the glow-plug clip and listen to the motor. If the motor slows down, reduce the nitro content; if it speeds up noticeably, add more nitro. The idea is to find a fuel that causes the engine to speed up just a trace when the plug is hit with power from the clip. Make sure that you check the freebie info ads from Duke Fox, and, if you have a question, drop him a letter. Tell him that you were on the pipe and airborne when suddenly... you reached the end of this month's column. Maneuver complete.

**The following are the addresses of the companies mentioned in this article:*

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

Slimline Mufflers, P.O. Box 3295, Scottsdale, AZ 85257.

Golden Gate Hobbies, P.O. Box 123, San Bruno, CA 94066.

MK Model Products, 12420 Burbank Blvd., North Hollywood, CA 91607.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728. ■

SCORPIO

(Continued from page 65)

tank and engine, as well as the covering material and paint.

Although I built the Fiesta according to the plans, if I were to build another I'd make the following changes: I'd use a 2¼-inch rather than a 2-inch diameter spinner, to allow strengthening of the nose. With a 2-inch diameter spinner, you have to taper the nose so that there isn't much "balsa meat" up front. With a smaller motor, the problem might disappear, but the Bull Ring Super Tigre 46 fills up the nose completely. I'd also change the vertical fin gluing surface. It's held in place by about a 1-inch gluing surface on the stab leading edge and a 4-inch connection on the top of the fuselage. Also, I'd fair the canopy with Stuff or its equivalent, because, without this blending, a 1/16-inch lip is visible. One other change I'd make is the addition of retracts, because the Fiesta is a real hummer. However, for this review I built the kit as stock.

PERFORMANCE: Using a Kraft FM two-stick 7-channel radio, flying was a pleasure. My son handled the first flight, as he usually flies two-stick whereas I fly single. The takeoff was as straight as an arrow, and the plane was airborne in about 40 feet. The Fiesta will do whatever you command it to do—spins, knife-edge, slow inverted flight, and so on.

When I finally got a turn with the model, I flew mostly with the right stick and left-stick rudder. The Fiesta is fast with a 46, but it's quite docile at low power settings. The aircraft has 6-inch long leading-edge, anti-stall devices on each side of the wing near the fuselage, and they really do work. The aircraft doesn't fall out at very slow approach speeds.

Try a Scorpio! It's a great plane, and I'm sure you'll enjoy building it.

**Here are the addresses of the companies mentioned in this article:*

Tower Hobbies, P.O. Box 778, Champaign, IL 61820.

Hot Stuff, P.O. Box 836, Simi, CA 93062.

Cheveron Hobby Products, 902 Second St., Sandusky, OH 44870.

Bull Ring Super Tigre 46; Imported by Tower Hobbies. ■

GOLDEN AGE

(Continued from page 83)

fully developed; relayless reeds showed great promise; along with Ni-Cds, the transistor was reshaping the whole of R/C. In such a short time period, how was the average modeler supposed to absorb it all?

We found a most interesting article by a leading radio manufacturer who pointed out how the confusion extended beyond the modeler to the industry. What makes this writing more interesting now is that we can relate to what was said, knowing all that happened afterwards.

In 1964, Phil Kraft was a leading R/C manufacturer and also an R/C competitor of considerable renown—a person to listen to. At the time, *Grid Leaks* (published by Ace R/C; Bill Winter, editor) magazine was a sounding board for the R/C experts. It was all R/C in a day when the major magazine featured C/L and F.F. Perhaps it was the granddaddy to the first all-R/C national magazine, *R/C Modeler*. Anyhow, in the May/June '64 issue, Phil Kraft wrote a lengthy treatise in an attempt to put proportional control into perspective for all modelers. As he said, proportional was so new that there were no experts. Everyone was learning. The writing is extensive, well worth reading, and we think you'll enjoy the high points of those times.

Phil starts with some useful history, saying that Jerry Pullen flew the first feedback-style proportional in 1958. Six years later, the desired operation and best method had yet to be determined. He goes on to say that Don Mathis and Doug Spreng eventually developed the digital method which grew to the present day. Kraft Systems had just completed a two-year development of what they considered to be a usable proportional system. The basics of propo didn't come quickly or easily.

From this base, Phil went on to express his thoughts about propo and the future of R/C. He wondered what would be good for R/C. At the time, he felt that R/C was a thriving amateur hobby with 99 per cent of the fliers enjoying the fun without competition. His concern was that the apparent cost of exotic propo equipment, plus the demands of extensive competition, could create a too professional atmosphere and, perhaps, even restrict the hobby's growth. To some extent, that does seem to have happened to this competition portion, but it is apparent that no one could foresee the enormous growth of R/C at that time.

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GOLDEN AGE

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As examples, Phil used two other sports that peaked in 1964: hot rods and sports cars. These started in back yards, then spread quickly until great numbers were enjoying the sports on a do-it-yourself basis. Then competition entered, creating a demand for more and more elaborate equipment. The high costs brought in sponsors and eliminated the average participant. These sports quickly diminished to a restricted, professional level. Phil wondered if propo costs would kill R/C in a similar manner. He suggested that reeds were a practical way to fly and that the much lower cost would satisfy the needs of budding R/Cers. (You should know that the cheap reed system cost the equivalent of $2,000 today.)

Most interesting is his comparison of complexity and cost, which have both reduced drastically. Consider that one integrated-circuit chip replaces many, many transistors. Phil starts by saying that a propo system would cost several times the $400 reed price tag due to its parts count and complexity.

He tells us that a reed system required 19 transistors, used simple toggle switches for transmitter controls and required seven and a half man-hours to complete. In contrast, the Kraft proportional required 69 transistors, the transmitter used intricate control gimbals and needed forty man-hours to finish. In addition, because of its complexity, quality control required assembly only by qualified technicians. If Phil could only have visualized the electronic assembly lines we use today! Perhaps he did, for eventually Kraft Systems became a leader in R/C assembly techniques.

Phil's explanation of the development problems shows us some factors which still exist. For instance, excellent propo control response requires the link between the transmitter and receiver to be absolutely solid (like a mechanical connection), and this is very difficult to attain. A model flies through a vast variety of conditions relative to the transmitter antenna. Consider the various attitudes it presents from tail-first, sideways, vertical, inverted, to head-on as the flight progresses. The signal level at the receiver varies as the attitude changes.

Also, the transmitter signal may be reflected from background objects so that the receiver may see two signals slightly out of phase. In addition, both outside and internal (vibration-created) interference could alter the desired coding. Such factors led to the coining of the familiar term "glitch." Phil's sales pitch for reeds pointed out that reeds weren't affected by such conditions.

Within a very short time, a simple circuit addition called "automatic gain control" was added to the receiver. With this, the weakest and strongest signals received were passed on at a *constant* amplitude. Any signal at all would be sufficient to trigger the rest of the circuitry. Such a simple invention solved a great many problems.

Phil went on to explain the embryonic status of proportional by describing various types of systems which manufacturers had under development. It was apparent that no one method had yet shown

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GOLDEN AGE

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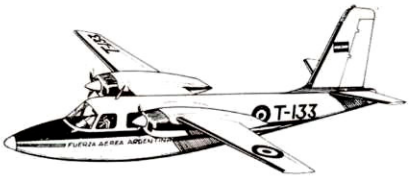
superiority He pointed out that each had shortcomings and concluded that it would take a major breakthrough to provide a reliable system at a reasonable price.

If a modeler had to have a proportional system, Kraft would custom-build one for $900.

Following these early (1964) efforts, Kraft Systems went on to become a leader in the production of proportional systems. A major breakthrough did take place. It reminds me of President Kennedy stating that the U.S. would land a man on the moon within 10 years and the many who scoffed at his statement. Almost anything is possible if you put your mind to it, as Phil Kraft must have done!

In signing off, I thank you all for the many letters telling us how you enjoy the "Golden Age" series. Your experience adds flavor to what *could* be a dull history lesson! There must be thousands of modelers who were either involved with Phil Kraft or his equipment, yet we have very little information about his part in R/C. The same goes for Orbit and Dunham. Any help from our readers would be greatly appreciated! ■



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